

VP410/VP412
LaserVision
disc drive

Operating Instructions



PHILIPS

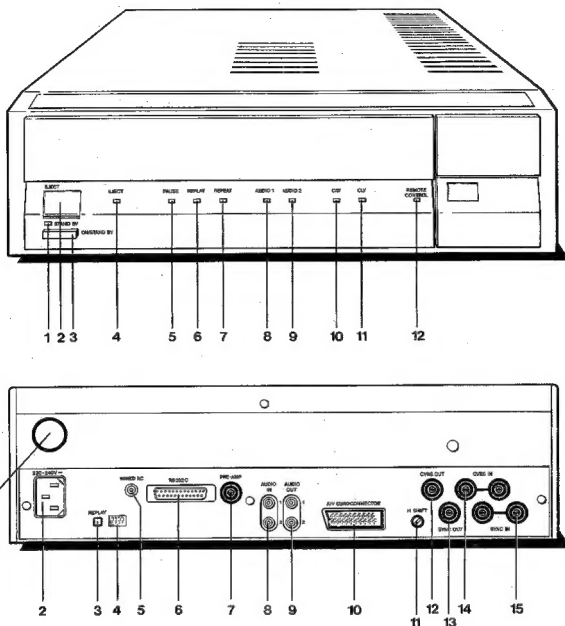
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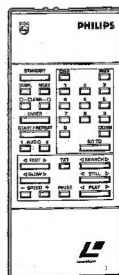
Fig. 1a: VP410 CONTROLS AND CONNECTIONS



VP410 (front)

VP410 (rear)

- | | | |
|-----------------------------|----------------------------------|--------------------|
| 1 STANDBY indicator | 1 ON/OFF switch | 14 CVBS IN sockets |
| 2 EJECT button | 2 MAINS lead socket | 15 SYNC IN sockets |
| 3 ON/STANDBY button | 3 REPLAY on/off switch | |
| 4 EJECT indicator | 4 BAUD RATE dip switches | |
| 5 PAUSE indicator | 5 WIRED RC socket | |
| 6 REPLAY indicator | 5 RS232C socket | |
| 7 REPEAT indicator | 7 PRE-AMP OUT | |
| 8 AUDIO 1 indicator | 8 AUDIO IN (1 & 2) sockets | |
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| 11 CLV indicator | 11 H-SHIFT control [for Genlock] | |
| 12 REMOTE CONTROL indicator | 12 CVBS OUT socket | |
| | 13 SYNC OUT socket | |



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INTRODUCTION

The VP410/VP412 LaserVision disc drive is primarily designed for use in interactive computer-controlled systems that exploit the capabilities of LaserVision as a versatile, high-quality storage/retrieval medium. Communication between the VP410/VP412 and a controlling computer is via standard RS232-C or IEEE-488 interfaces. The VP410 is only fitted with the RS232-C interface, whereas the VP412 is fitted with both the RS232 and IEEE-488 interfaces. The player can be used with LaserVision discs containing audiovisual and program information. The program data takes the place of the audio channel on some or all sections of the disc (by means of the program dump via the data in audio 2 channel).

The VP410/VP412 can be used for direct playback of LaserVision CAV (Active play) or CLV (Long play) discs. In this respect it has extensive program control, with search and memory facilities, conveniently operated from the remote control handset.

THE LASERVISION SYSTEM

LaserVision is the only audiovisual playback system using optical (laser beam) readout. The laser beam, concentrated to a fine point (60 times finer than a record player stylus), reads very densely-packed information under the transparent sealed surface of the LaserVision disc.

The reproduced picture is very high quality with 2-channel mono or stereo sound. There is no wear to the disc or 'pick-up', and the discs are extremely scratch resistant and almost unaffected by dust or finger prints.

Types of LaserVision disc

Two types of disc are available and the player will operate with either of these:

1. **Normal CAV** (Active play) discs spin at a constant speed of 1500 r.p.m. They have a maximum capacity of 54 000 pictures per side (36 minutes played at 25 pictures per second) and offer special LaserVision effects such as still, slow-motion, reverse play, fast forward, fast reverse and goto picture or chapter number.
2. **CLV** (Long play) discs spin at a speed which gradually decreases as the disc plays. They offer continuous forward play only, but with time and chapter search, and the advantage of an increased playing time of 1 hour per side.

FEATURES OF THE VP410/VP412

RGB output/PAL-RGB decoder

The VP410/VP412 allows the best possible picture quality to be obtained from a LaserVision disc, by employing a high quality PAL-RGB decoder. Within the LaserVision format, video information is stored on the disc in PAL-encoded form. This can cause problems when the disc is played in 'still frame' or 'slow motion', or any other non-standard playing mode, because the PAL 8-field sequence becomes destroyed. In order to correct this sequence such that a monitor can understand it and reproduce correct colour, many players incorporate a 'PAL Modifier'. This piece of circuitry corrects the PAL sequence, but in doing so, reduces the video bandwidth, and introduces other unwanted effects, e.g. echoes.

The VP410/VP412 tackles this problem by employing a fast-locking PAL-RGB decoder. Having this device built-in, allows its characteristics to be fully optimised to give the highest possible picture quality from the disc, even in non-standard playing modes.

The result is an RGB output giving the full 5 MHz video bandwidth in all playing modes. The benefit is particularly valuable when viewing video material such as maps with fine text.

RGB output also lends itself to simpler mixing with computer graphic output (also RGB), in external equipment if required.

Sync pulse generator

The VP410/VP412 contains an internal sync pulse generator (SPG) see later for further information

The SPG provides freshly-generated line and field sync pulses at the player's video output at all times. Following the decoding process from PAL to RGB (see above), fresh sync pulses are inserted into the RGB signal, which is available at the Euroconnector socket. Therefore a stable output from the player is guaranteed in all play modes, at all times.

Genlock

Genlock allows the field and line sync pulses from the player output to be synchronised with an external reference signal. It ensures correct overlay of video signals and can also prevent picture jump or roll. The reference signal, comprising line and field syncs (negative-going) should be applied to either of the two SYNC IN sockets. A horizontal shift of the overlay picture is achieved by adjusting the H-SHIFT control situated at the rear of the player.

Note: The player may take up to 2 seconds initially to effectively lock to a reference signal.

Program dump

Program dump is defined as loading the player's memory with a V-code program file.

This can be done by either an external computer, an EPROM cartridge or through audio-2 channel. The player's program dump memory can store up to 48 Kbyte.

When the player is initially switched ON it is in the stand-by mode. If the program dump switch at the rear of the VP412 is in the ON position at power up then it will attempt to load a V-code program from the EPROM cartridge. If it is unable to do this the VP412 will load a program from an LV-disc.

If the program load fails and the replay switch is in its OFF position, normal forward play is continued and all controls are enabled.

If the load fails and the replay switch is in its ON position, the VP412 commences REPLAY from picture number one or plays a

programmed sequence, see section 3, "SPECIAL PLAY FUNCTIONS" for further information.

CVBS output/RGB-PAL encoder

The VP410/VP412 contains an RGB-PAL encoder. This takes the RGB output from the player and encodes it into a CVBS signal using fresh sync pulses from the internal SPG. The signal available at the CVBS output is thus totally stable. It does however have a reduced bandwidth in all playing modes (approx 3 MHz).

Electronic timebase corrector

A charge coupled device (C.C.D.) timebase corrector is employed to provide correction of timing errors always present in the signal read from the video disc. This replaces the more traditional tangential mirror (mechanical method) allowing for a smaller, lighter optical system. This reduction in mass allows the optical readout unit to track the disc faster and thus reduces picture access time.

Teletext

The VP412 player is fitted with the Teletext facility which can generate teletext text and graphics. The teletext encoder can be addressed from an external computer via the RS232, IEEE-488 interfaces or from an internally dumped V-code program. Teletext may be displayed against either a black or against a normal video or transparent background.

Both teletext text (i.e. alpha/numeric characters) and graphics (shapes based upon a 2 x 3 matrix) may be produced, as with normal broadcast teletext.

Desired graphic characters are produced by transmitting the appropriate ASCII codes. See section 7, for further information.

Instant jump

The VP410/VP412 also incorporates an 'Instant Jump' feature. Essentially this means that the radial mirror which points the laser beam at the required disc track can be made to 'twitch' and therefore jump a predetermined number of tracks (max. 50) in either direction during the vertical interval. Small jumps are invisible, as they can be performed within the video blanking. This gives the effect of an instant search to the required picture - almost as if it were immediately adjacent to the current picture.

This feature is valuable in for example map-walking, where each picture contains a map of an area and each successive picture shows adjacent areas. The user can 'scan' across map boundaries with no 'black picture' between maps while the player searches for the next picture.

Details of the types of jump possible, and their associated commands are given in the F-Code command list (see Section 6).

Fast random access

The VP410/VP412 features a very fast random access time; this is the time needed for the optical readout unit to move from one point on the disc to another, which may be anywhere on the disc. Figures are typically 1 s for a CAV disc and 5 s for a CLV disc.

Wired remote control

In some applications it may be necessary to put the VP410/VP412 out of direct-line-of-sight. In such cases, the infra-red beam of the remote control handset may not be able to operate the unit. For reliable operation under such conditions, the remote control handset should be used the connecting lead. This lead plugs in to the WIRED RC socket at the rear of the player and the connection port on the remote control handset.

INSTALLATION

SITING THE PLAYER

Stand the player on a firm level surface, ensuring that the ventilation slots on the top and sides of the player are not obstructed. Do not stand a monitor directly on top of the player if it obstructs the ventilation slots. A properly designed rack should be used to support the monitor. Never stand the player directly on any electronic equipment that gives off a substantial amount of heat, or near to any heat source. Avoid any position where the player is subjected to direct sunlight for long periods.

CONNECTING THE PLAYER TO THE MAINS

The VP410/VP412 is designed to operate from a 50 Hz mains supply with any voltage between 220/240 V. If your local mains supply does not fall into this category, contact your nearest Philips Organisation.

If necessary, fit a mains plug to the mains lead as described below.

Important note for U.K. users

The mains lead wires are coloured in accordance with the following code:

Green-and-yellow: Earth

Blue: Neutral

Brown: Live.

WARNING: This unit must be earthed.

These colours may not correspond with the colour markings identifying the terminals in your plug, so proceed as follows: Connect the Green-and-yellow wire to the terminal marked E or, coloured Green or Green-and-yellow; Connect the Brown wire to the terminal marked L, or coloured Red; Connect the Blue wire to the terminal marked N, or coloured Black.

Insert the mains plug into a wall socket. If the player is not to be used for a long period of time, remove the mains plug from the wall socket.

CONNECTING THE PLAYER TO A MONITOR

The VP410/VP412 has outputs suitable for both RGB monitors and CVBS monitors. Various connection possibilities are described below. Also refer to Fig. 2 - 'Connection and adaptor cables'.

Note: Some monitors have a 'time-constant' switch for use with a VCR; this should be set to the 'normal' (i.e. non-VCR) position for LaserVision use.

Euroconnector to Euroconnector

This is a direct connection, ensuring the highest quality picture and, if the monitor is equipped for it, stereo sound. It is also possible to use a TV receiver if it is fitted with a Euroconnector socket.

Connect the cable supplied between the A/V EUROCONNECTOR socket on the rear of the player and the corresponding socket on the monitor. This connection carries both RGB and CVBS signals. Optimum picture quality is obtained if the RGB signals are used. Therefore if the monitor accepts both RGB and CVBS signals, ensure that it is switched to RGB input.

If no Euroconnector socket is available:

1. Euroconnector-to-DIN AV (audio/video) - CVBS only

If the monitor is fitted with a 6-pole DIN AV (Audio-Video) socket, the Euroconnector-to-DIN AV adaptor cable SBC 1012 (4822 321 20485, length 1.5 m) must be used. Connect the Euroconnector plug to the A/V EUROCONNECTOR socket of the player and the DIN AV plug to the monitor.

2. If the monitor is fitted with a coaxial BNC-type video input socket, there are two possibilities:

a. Euroconnector-to-BNC - CVBS only

Using Euroconnector-to-BNC adaptor cable SBC 1013 (4822 321 20484, length 1.5 m), connect the Euroconnector plug to the A/V EUROCONNECTOR socket of the player and one coaxial BNC plug to the video input of the monitor. Connect the 5-pole DIN Audio plug of this adaptor cable to the Audio input socket of your monitor or to an audio amplifier.

b. BNC-to-BNC (coaxial) - CVBS only

Using BNC-to-BNC connection cable SBC 1014 (4822 320 11003, length 1.5 m), connect between the CVBS OUT socket of the player and the video input of the monitor. The Audio signal must be taken from the AUDIO OUT sockets of the player using a connection cable SBC 044 (4822 321 20344, length 10 m).

CONNECTION TO PERIPHERAL AUDIO EQUIPMENT

The AUDIO OUT sockets on the rear of the player can be connected through connection cable SBC 043 (4822 321 20308, length 2.5 m) or SBC 044 (4822 321 20344, length 10 m) to a linear input of the peripheral equipment. Either or both sound channels may be switched on or off by means of the AUDIO 1 and AUDIO 2 buttons on the remote control handset.

If a disc contains stereo sound, this will be reproduced stereophonically when both channels are in operation.

Note: If either audio channel is switched off, then the remaining audio signal is routed to both output channels. This avoids 'one-sided' sound from a dual-language disc.

REMOTE CONTROL HANDSET (Figs. 1a, b AND 3)

Normally, the VP410/VP412 operates by remote control from the infra-red remote control handset supplied. The control buttons on this handset have been grouped into logically-related sections.

The remote control handset controls all play functions, audio and memory controls.

The handset can be used in conjunction with the infra-red detector on the VP410/VP412 itself, or, when a Euroconnector connection is used, with the infra-red detector on the monitor (dependent on actual monitor model).

When using the handset, point it directly at the infra-red detector on the front of the player (or monitor).

If this is not possible, or not convenient, the remote control cable supplied can be connected between the handset and the player (see 'Wired remote control' earlier in this section).

The handset requires 4 x 1.5 volt batteries, type R03 or UM4, located in its base (See Fig. 3).

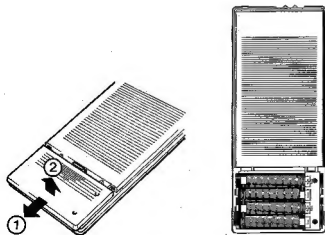


Fig. 3: Inserting batteries in remote control handset

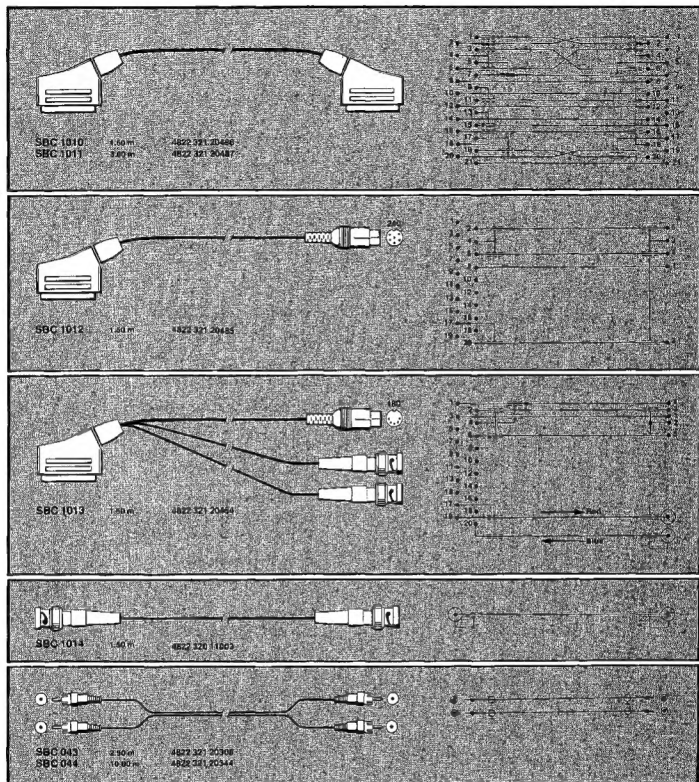


Fig. 2: Connection and adaptor cables

CONTROLS, INDICATORS AND CONNECTIONS (Fig. 1a or b)

SUMMARY OF CONTROLS

Front of player

• EJECT button (2, 2)

For opening the disc-tray and ejecting a disc if one is loaded.

• ON/STANDBY button (3, 3)

For switching between 'standby' and 'on' modes. This button also effects a CPU reset.

REAR OF PLAYER (numbers refer to Fig. 1a or b)

• ON/OFF switch (1, 1)

Primary mains power switch.

• REPLAY on/off switch (3, 3)

Switches the replay function on or off. See 'Replay' in Section 3.

• BAUD RATE dip switches (4, 4)

For selecting the baud rate for RS232-C communication. See Section 4, "INTERACTIVE OPERATION/COMMUNICATION"

• TRANSMISSION DELAY dip switch (4_s, 4_s)

For switching the transmission delay ON or OFF.

• INTERFACE BUS SELECTION dip switch (4_s)

For selection between either RS232 or IEEE-488 interface buses.

• PROGRAM DUMP on/off switch (5)

For the loading of V-code programs via the host computer, an EPROM cartridge or LV-disc. See APPENDIX 1 "V-CODE PROGRAMMING" for further information.

• IEEE-488 ADDRESS SELECTION dip switches (10)

For selecting IEEE-488 communication addresses. See section 4, for further information.

• H-SHIFT control (11, 14)

To shift the horizontal position of the picture when using an external sync signal (connected to either of the SYNC IN sockets). See 'Genlock' in Section 1.

SUMMARY OF FRONT-PANEL INDICATORS

The following indicators give status information about the VP410/VP412:

STANDBY (red) Lights in standby mode and flashes during start-up.

EJECT (green) Flashes during eject.

PAUSE (green) Lights during pause.

REPLAY (green) Lights when replay function is active.

REPEAT (green) Lights when repeat function is active.

AUDIO1 (green) Lights when audio channel 1 is enabled.

AUDIO2 (green) Lights when audio channel 2 is enabled.

CAV (green) Lights when playing CAV discs.

CLV (green) Lights when playing CLV discs.

REMOTE CONTROL (green) Flashes to confirm that player is receiving a remote control command.

SUMMARY OF CONNECTIONS (NUMBERS REFER TO Fig. 1a or 1b)

• MAINS lead socket (2, 2)

For connection of the mains lead.

• WIRED RC socket (5, 6)

For wired connection of the remote control handset, using the remote control cable supplied. This permits the remote control to be used when the VP410/VP412 is not in direct-line-of-sight (See 'Wired remote control' in earlier in this Section)

• RS232C socket (6, 8)

Provides a serial connection for an external computer and for the touch screen facility.

• IEEE-488 socket (7)

Provides a connection for an external computer or for the touch screen facility.

• AUDIO IN (1 and 2) sockets (8, 11)

Used for connection of an external stereo or 2-channel sound source.

AUDIO L = AUDIO 1;

AUDIO R = AUDIO 2.

• AUDIO OUT (1 and 2) sockets (9, 12)

Used for connection to an external stereo or 2-channel sound amplifier.

AUDIO L = AUDIO 1;

AUDIO R = AUDIO 2.

• A/V Euroconnector (10, 13)

Provides connection for variety of inputs and outputs for a monitor. See Section 8 - 'Technical data' for full details.

• CVBS OUT socket (12, 15)

Provides a video signal output suitable for a monitor. For further information, refer to 'CVBS output / RGB-PAL encoder' in Section 1.

• SYNC OUT socket (13, 16)

Provides a synchronising signal for the host computer or a VP410/VP412 connected in parallel.

• CVBS IN sockets (14, 17)

These two sockets are internally connected; either of them may be used. They accept an external video input signal, e.g. from a second VP410/VP412. The signal may be looped through to other equipment using the second CVBS IN socket. If no such loop is used, the second socket must be properly terminated with a 75 ohm plug. To lock the CVBS signal to an external RGB signal (for mixing purposes), it must be looped-through to one of the SYNC IN sockets.

• SYNC IN sockets (15, 18)

These two sockets are internally connected; either of them may be used. They accept an external video synchronising signal which may be looped through to other equipment using the second SYNC IN socket. If no such loop is used, the second socket must be properly terminated with a 75 ohm plug.

Note: The reference signal must conform to broadcast standards in respect of pulse-shape and timing (a standard CVBS signal is suitable).

- **PRE-AMPOUT (7,9)**

This socket can be used in combination with the applicable electronics for applications such as data recovery or low specification demodulation of a video signal. Contact your local Philips sales office for further information.

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PLAYING A DISC (Refer to Fig. 1a or b)

SWITCHING ON

Switch on the player using the mains ON/OFF switch located at the rear. Check that the REPLAY switch is in the OFF position. The STANDBY indicator will light. Press the ON/STANDBY button; the STANDBY indicator will then flash. A warning 'beep' is given to indicate that no disc has yet been loaded.

Note: The VP410/VP412 contains a fan to maintain correct operating temperature. If a certain temperature is exceeded, the speed of this fan will automatically increase; this is quite normal and not a fault indication.

INSERTING A DISC

Press the EJECT button; the disc-tray will partly open. Pull the disc-tray fully open. Remove the disc from its packaging and place it on the disc-tray with the desired label uppermost.

AUTOMATIC PLAY

Gently push the disc-tray forward, until it is drawn closed automatically. The disc will build up to speed (1500 r.p.m.) in approx. 13 seconds. During the start-up period, the STANDBY indicator flashes.

As soon as the correct speed has been reached, the STANDBY indicator goes out and either the CAV or CLV indicator lights, according to the type of disc loaded. Play then commences. Also refer to Section 3 - 'Special play functions'.

When the end of the disc is reached, the player returns rapidly to the first track, gives a warning 'beep', and enters the pause mode. If no further command is given within 2 minutes, the player goes to standby.

If repeated playing of the disc is required, the REPLAY switch should be in the ON position. This will be confirmed by the REPLAY indicator. The controls on the front of the player are disabled during replay.

TO STOP PLAY AND REMOVE THE DISC

To terminate play at any time, press the EJECT button on the front of the player. When the disc comes to a halt, the player ejects the disc and goes to the standby condition.

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SPECIAL PLAY FUNCTIONS

All the functions described in this section may be performed using the remote control handset. Some functions have different effects depending upon the present mode (e.g. whether the player is currently playing a disc or not). CAV (Active play) and CLV (Long play) discs also have certain commands which can only be used with that type of disc.

If the remote control handset does not function, check that the RC IR/EURO switch on the rear of the player is in the IR position.

STANDBY

Pressing this button during any play operation will cause the current action to cease. The player goes to the standby mode. Any on-screen display goes out and the STANDBY indicator on the front of the player lights. If programming is in progress, it is terminated. Pressing any playing mode button while the player is in standby, causes the player to commence that action.

Note: If the replay function is in operation, the STANDBY button is disabled.

PLAY FORWARD

Pressing the **▶** section of the PLAY button starts forward play (at normal speed).

PLAY REVERSE (CAV only)

Pressing the **◀** section of the PLAY button starts reverse play (at normal speed).

STILL (CAV only)

When either section of the STILL button is pressed, the picture becomes stationary. A still picture is useful for the close examination of a situation (for example, in sport), or the study of details (in an instructional programme). It can also serve as a short interlude during playback.

STEP FORWARD AND REVERSE (CAV only)

If the **▶** or **◀** section of the STILL button is pressed, the following or preceding picture appears respectively.

PICTURE NUMBER, CHAPTER NUMBER AND TIME CODE DISPLAY

Each individual picture on a CAV disc has a unique number which is encoded on the disc. Discs may also be divided into chapters; these chapter numbers are also encoded on the disc.

To display the current picture number on the monitor screen (Fig. 4), press the PNR button. The play mode is also displayed. Press the button again to remove the display.

To display the chapter number on the screen (Fig. 5), press the CNR button. Press it again to remove the display.

STILL PNR 1642

Fig. 4: Picture number display

PLAY FWD CNR 2

Fig. 5: Chapter number display

In CLV discs, an elapsed time code is encoded on the disc. This time code may be in minutes only or in minutes and seconds, depending on the particular disc.

Some CLV discs are also divided into chapters, and these chapter numbers encoded on the disc.

To display the current elapsed time on the screen (Fig. 6), press the PNR button. Press it again to remove the display.

To display the chapter number on the screen (Fig. 5), press the CNR button. Press it again to remove the display.

PLAY FWD TIME 11:23

Fig. 6: Time code display

PLAYER AND DISC STATUS DISPLAY

Pressing the DISPLAY button will cause the player and disc status to be displayed on the screen. Disc status (e.g. CAV/CLV, side, size, etc.) is shown on the right and player status (e.g. Audio 1 on) on the left.

Note: The disc status indication mentioned above is not put on old LV-discs

Pressing the button again switches the display off. If, however, the picture number etc. was being displayed on the screen, the player enters the programming mode. See 'Programming' later in this section.

VIDEO ON STEREO
AUDIO1 ON
AUDIO2 ON
SLOW 1/3 CAV
FAST 3 SIDE 1
9600 BAUD 30 CM

Fig. 7: Player and disc status display

SEARCH

If only a part of a disc is required, it can be quickly found using the SEARCH button. Pressing and holding the appropriate section of this button moves the optical readout unit in the desired direction at approximately 20 times normal speed.

During this search action you will see on the screen a very rapid succession of pictures from the programme.

When the button is released, the player reverts to the mode which it was in prior to searching.

It is often useful to have the picture number etc. displayed while searching.

When searching a disc containing chapter numbers, then if these numbers are displayed, the player automatically reverts to its previous mode when it reaches the next chapter.

If it is desired to continue searching this next chapter, release the SEARCH button and press again. Searching then continues to the next chapter.

If chapter numbers are not displayed, searching is uninterrupted throughout the disc.

With CLV discs, the SEARCH button operates in the same way as for CAV discs, but the display shows the elapsed time or chapter number, as appropriate. (not on short chapters).

PAUSE

When the PAUSE button is pressed, the player stops, both audio and video are muted and the PAUSE indicator lights.

Note: Only available with the VP412

To resume the previous action, press the PAUSE button once more. While in the pause mode, other functions may also be started by pressing the appropriate buttons (e.g. PLAY, STILL, SEARCH etc.).

SLOW (CAV only)

Forward or reverse slow motion is obtained by pressing the SLOW button. The slow motion speed may be altered by means of the SPEED + and - buttons.

The speed can be adjusted in steps to 1/3, 1/10, 1/25, 1/50 or 1/100 of the normal speed (which is 25 frames per second); 1/3 of normal speed is the default value.

FAST (CAV only)

Each time the **▶** or **◀** section of the FAST button is pressed, the optical readout unit moves at 3 (default value), 10 or 20 times its normal speed in forward or reverse, the effect on the screen being that of rapid motion. The speed is set using the SPEED + and - buttons.

AUDIO

The LaserVision disc contains not only picture information, but can also accommodate two sound channels. These can provide stereo sound, or separate sound channels; for example, a commentary in two languages.

When the player is switched on, it always assumes the forward play mode, with both sound channels enabled. In the case of separate sound channels, you can switch one of them off by pressing the relevant AUDIO button (1 or 2). In this case the enabled audio channel appears at both outputs. Depending if the disc contains disc program status information, the audio 2 will be switched off if two separate sound channels (bilingual) are on the disc.

To switch on again, press the appropriate button; the enabled channels are indicated by the AUDIO 1 and AUDIO 2 indicators on the front panel.

Note: Sound is audible in the forward play mode only.

GOTO PICTURE NUMBER (CAV only)

- If no picture number is currently displayed on the monitor, press the PNR button. A picture number appears.
- Press the digit buttons (max. 5) corresponding to the picture number you want to go to (e.g. 2, 2, 1, 3, 5, if you want picture number 22135). If you make a mistake, press the CORR button and start again. As soon as you press the first digit the player assumes the still mode. The number you select is displayed below the current picture number.
- Press the GOTO button. The player will quickly look for the number selected. During this action sound is muted, and the monitor screen is blank, but the selected number is displayed. On arrival at the selected picture number, the corresponding picture appears on the monitor in still mode. Now you can select any play mode by pressing the corresponding button.

GOTO CHAPTER NUMBER

- If no chapter number is currently displayed on the monitor, press the CNR button. The chapter number, if available on the disc, appears.
- Press the digit buttons (max. 2) corresponding to the chapter number you want to go to (e.g. 2 if you want chapter 02). If you make a mistake, press the CORR button and start again. Note that with CAV discs, the player assumes the still mode as soon as you press the first digit. The number you select is displayed below the current chapter number.
- Press the GOTO button. The player quickly looks for the first picture of the chapter selected. During this action, sound is muted and the monitor screen is blank. On reaching the required chapter, the player starts normal forward play.

GOTO TIME POSITION (CLV only)

With CLV discs it is possible to go to a selected time position on the disc.

- If no time position is currently displayed, press the PNR button. A time position appears on the screen.
- Press the digit buttons corresponding to the minutes of the time position you want to go to; the number you select is displayed below the time code. If you make a mistake, press the CORR button and start again. Some new discs also allow you to enter seconds as well. To enter the seconds, press the ENTER button and then use the digit buttons.
- Press the GOTO button. The player will quickly look for the number selected. During this action sound is muted, and the selected time position is displayed. On arrival at the selected time position, play starts from that point.

START/REPEAT

Pressing the START/REPEAT button either starts playing a programmed sequence (if one has been set up) while the picture number etc. is displayed on the screen, or starts playing the entire disc from the start. If the button is pressed again, play returns once more to the start of the disc or programmed sequence. This feature can be used to run a programmed sequence, see 'programming' overleaf for further information.

REPLAY

The REPLAY switch is situated at the rear of the player.

If the player is switched on when the REPLAY switch is on, the player automatically starts up in the replay mode. If the player is already on and the REPLAY switch is switched on, play immediately starts at the beginning of a programmed sequence, or returns to the start of the disc.

In the replay mode, the player is in a continuous play loop. If a programmed sequence is in memory, that sequence will be played over and over again. (A picture number or time code sequence has priority over a chapter number sequence.) If there is no sequence in memory, the whole disc will be played over and over again. The REPLAY indicator on the front of the player lights. This feature can be used after a program sequence has been entered, see 'Programming' overleaf for further information.

Note: In the replay mode, all controls except the following are disabled:

START/REPEAT, which moves play back to the start of the sequence (or disc).

NEXT, which moves play to the next segment (or chapter) in a sequence.

PNR and CNR

AUDIO 1 & 2

TXT

To exit the Replay mode, press the REPLAY switch at the rear of the player.

TXT BUTTON

This button is only effective if the player is connected to a TV set with Teletext and Euroconnector remote control facilities.

Pressing the TXT button switches the monitor display between: TV mode, TXT mode and mixed mode.

PROGRAMMING

It is possible to set up a sequence of picture numbers, chapter numbers or time codes by programming via the remote control handset.

1. Press either PNR (for picture number or time code programming) or CNR (for chapter number programming), so that the display appears on the screen.
2. Press the DISPLAY button. The current program (if any) is then displayed on the screen. See Fig. 8.

PROGRAM 1	PNR	1642
1000	PLAY FWD	2000
3200	FAST* 10	4500
2500	PLAY REV	1000
51000	SLOW: 50	51500
2569	STILL 60	2579

PROGRAM	CNR	2
1.CNR	5	9.CNR
2.CNR	7	10.CNR
3.CNR	9	11.CNR
4.CNR	16	12.CNR
5.CNR	18	13.CNR
6.CNR	20	14.CNR
7.CNR		15.CNR
8.CNR		16.CNR

PROGRAM 1	TIME	1:23
12:45	PLAY FWD	17:20
23:00	PLAY FWD	28:25
45:22	PLAY FWD	56:55
58:00	PLAY FWD	59:16

Fig. 8: Programming display

The player is now in the programming mode. You are able to modify the existing program or enter a new program. A flashing cursor indicates the current entry position on the program table. The contents at this position may be changed.

PICTURE SEGMENT PROGRAM ENTRY

A picture segment program may be up to two pages long, each page consisting of 8 segments. A segment is displayed as one line on the screen.

e.g. 15000 PLAY FWD 20500

Picture numbers may either be entered directly (using the 0 - 9 digit buttons) and then pressing ENTER, or by storing the current picture number. To correct numbers entered directly, use the CORR button. When the cursor is in an empty picture number position, the player can be controlled in the usual way with the PLAY, SLOW, FAST and STILL buttons. If during play you press the ENTER button, the player halts and the current picture number is stored.

The required action (PLAY, STILL, etc.) is selected by pressing the corresponding button on the remote control handset and then pressing ENTER. Until ENTER is pressed, the action may be changed simply by pressing another button instead.

With some functions (e.g. SLOW), extra information, such as the speed, may also be entered (e.g. 10 for 1/10 normal speed by pressing either the speed + or - buttons). Note that for STILL, it is necessary to enter the duration (in seconds). Pressing the ENTER button moves the cursor to the next entry position. If no action is entered, PLAY is assumed.

The program is displayed on the screen below the playing mode. To move on to the next line of the program, press the NEXT button. Pressing this button on the last line of the program moves the cursor back to the first line again.

To clear the program displayed, press both CLEAR buttons at the same time.

To move to the start of page 2 while page 1 is displayed, press the DISPLAY button. Pressing the DISPLAY button when on page 2 ends programming and returns to normal operation.

To play this sequence see 'Playing a programmed sequence' below.

The program is saved by the player until it is cleared (by pressing both CLEAR buttons) or until it is updated.

CHAPTER PROGRAM ENTRY

This is performed in a similar way to 'Picture segment program entry' described above. Up to 16 chapters may be stored in any order; repetition of a chapter in the program is also allowed. Chapter numbers must be entered directly using the 0 - 9 digit buttons. To correct an entry, use the CORR button.

The ENTER and NEXT buttons both move the cursor to the next line, except when at the last line, when they move the cursor to the first line again.

To clear an entire sequence, press both CLEAR buttons at the same time.

To end programming mode, press **DISPLAY**. Any empty positions in the chapter sequence will be ignored when the sequence is played back.

To play this sequence see 'Playing a programmed sequence' below.

The program is saved by the player until it is cleared (by pressing both **CLEAR** buttons) or until it is updated.

TIME SEGMENT PROGRAM ENTRY

This is carried out in a similar way to 'Picture segment program entry' described above. A time segment sequence may be up to 2 pages long, each page consisting of 8 segments. The format is:

time 1 **PLAY FWD** time 2

Where the time is in minutes and seconds (e.g. 23:30).

The time is entered either directly, using the 0-9 digit button (minutes and seconds must be entered, separately), or by storing the current time position during play. If during play you press the **ENTER** button, the current time position is stored. When entering the time directly, the **CORR** button may be used for correction. Depending on the disc used, the seconds entered may be ignored.

To move on to the next line of the program, press the **NEXT** button. Pressing this button on the last line of the program moves the cursor back to the first line again.

To clear the complete program, press both **CLEAR** buttons at the same time.

To move to the start of page 2 while page 1 is displayed, press the **DISPLAY** button. Pressing the **DISPLAY** button when on page 2 ends programming and returns to normal operation.

To play this sequence see 'Playing a programmed sequence' below.

The program is saved by the player until it is cleared (by pressing both **CLEAR** buttons) or until it is updated.

PLAYING A PROGRAMMED SEQUENCE

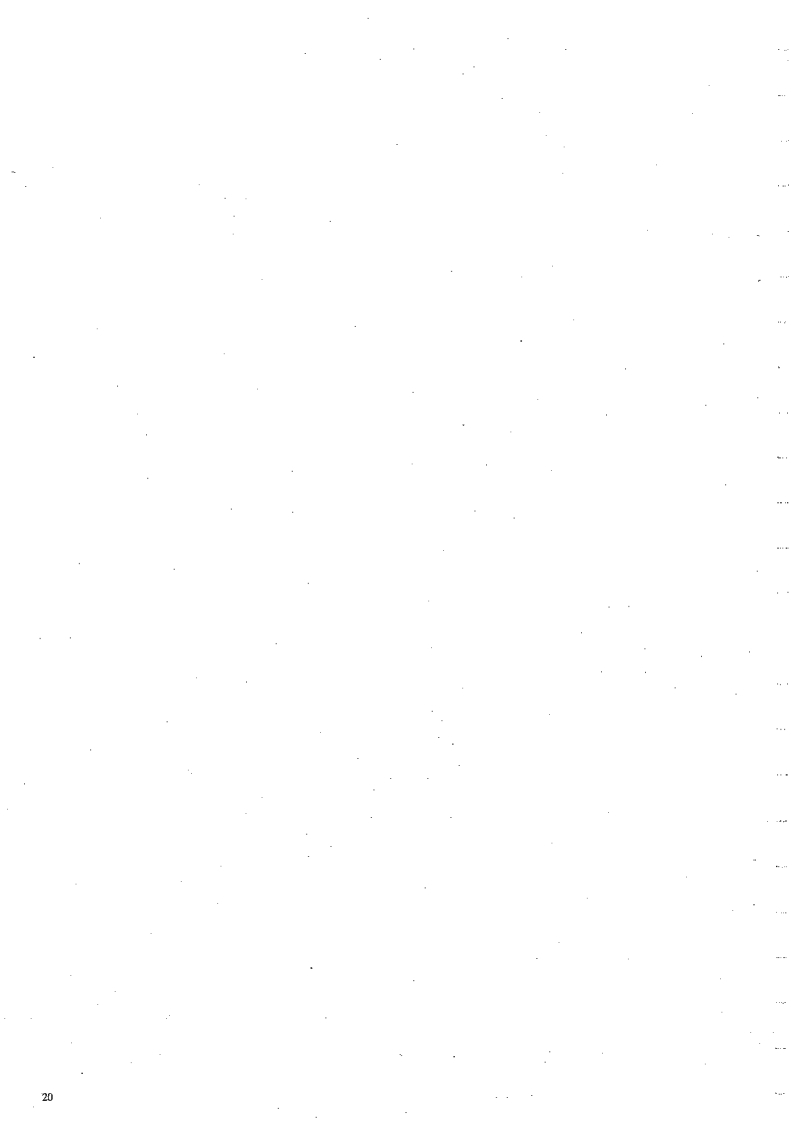
To play a sequence which has been stored in the memory as described above, press the **START/REPEAT** button, while the picture number etc. is displayed on the screen. The player quickly searches for the first picture of the sequence stored and then starts the required action.

The actions stored are carried out successively in the order in which they are stored. At the end of the last item the player halts (**CAV**) or goes to pause (**CLV**).

During search actions between items, sound is muted and the screen is blank.

A sequence can be stopped by pressing any action button (e.g. Play, Fast, Still).

The **NEXT** button moves the play to the next segment or chapter in a sequence.



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INTERACTIVE OPERATION/ COMMUNICATION

INTRODUCTION

This section describes the RS232C/IEEE-488 interface communication possibilities of the VP410/VP412 LaserVision player.

The VP410/VP412 can be controlled by means of an external computer via the RS232C interface, using a high level language such as BASIC or PASCAL.

The VP412 can also be controlled by an internally running V-code program. This can be loaded by an external computer (using either the RS232C or IEEE-488 interfaces), EPROM cartridge or LV-disc.

The VP410 is able to communicate in F-code (see sections 5 & 6 for further information), therefore mode selection is not necessary but can be used to "flush-out" the player's output buffer. The VP412 is able to communicate in both F- and V-code modes (see Appendices 1 & 2 for further information). With a mode selection command, the mode can be altered (see below).

DESCRIPTION OF F-CODE

F-code commands produce a reaction similar to a remote control instruction. An F-code string consists of one or more 8 bit bytes terminated by a carriage return <CR>. The player commences operation after the carriage return.

Each byte sent to the player is checked for validity. If an F-code string contains an ASCII code lower than 32, all bytes of the string, are rejected. For ASCII values greater than 127 the player effectively subtracts 128 from the ASCII value. A computer which transmits only seven data bits per ASCII code may therefore be used. In this case at least two stop bits must be sent.

The player commences action on the commands after receiving <CR>.

See sections 5 "F-CODE COMMANDS" and 6 "F-CODE PROGRAMMING" for further information.

DESCRIPTION OF V-CODE

V-code is a low level stack oriented programming language dedicated to LaserVision applications and in particular the VP412 LaserVision disc drive.

A V-code program can be loaded via an LV-disc, host computer using the RS232C/IEEE interfaces or an EPROM cartridge. See Appendix 1 "V-CODE PROGRAMMING" and 2 "V-CODE REFERENCE CARD" for further information.

MESSAGE TRANSFER PROTOCOLS

The communication protocols defined for VP410/VP412 are:

1. Mode selection protocol: from computer to player
2. F-code communication protocol: from computer to player and vice versa
3. V-code communication protocol: from computer to player and vice versa
4. Touch screen protocol: from touch screen system to player

Note: The touch screen protocol is independent of mode selection and can only be used to input into a running V-code program.

MODE SELECTION

In the VP412 two data transfer modes are available; F-code (all ASCII) or V-code.

When the VP412 is switched ON it defaults to F-code communication. The master (computer) has to perform a mode select before the data link can be used in a new mode. Thus the computer can control the

VP412 in either F- or V-code depending on which mode is selected. The player cannot perform mode selection.

To load, start, or continue a V-code program via the host computer a mode select is required, see PROGRAM DUMP in Appendix 1 for further information. A V-code program will run unless interrupted by a mode select.

After interruption, the player can be controlled externally by means of the host computer. The V-code program can be continued or restarted by the host computer, see PROGRAM DUMP in Appendix 1 for further information.

A mode select causes the output buffer in the player to empty. This feature can be used after the computer has kept the handshake inactive, for some time.

The transmission protocol for mode selection is:

- The computer sends two spaces (ASCII characters 32).
- The computer awaits ACK (if not received within 200ms, re-tries).
- The computer sends the mode select byte.
F=F-code
H=V-code (VP412 only)
- The computer awaits ACK (if not received within 200ms, tries again).

F-CODE MODE

F-CODE TRANSMISSION PROTOCOL FOR COMPUTER

The computer sends of one or more bytes terminated by a carriage return <CR>. With the exception of the <CR>, all bytes have ASCII codes greater than or equal to 32.

The first two characters in a string should not be 32 (<SPACE>) [reserved for mode selection] if in the middle of a string no character is received for at least 1 s, the player times-out and all the information received up to that point is lost.

F-CODE TRANSMISSION PROTOCOL FOR PLAYER

The player sends of one or more bytes terminated by a carriage return <CR>. With the exception of the <CR>, all bytes have ASCII codes greater than or equal to 32.

V-CODE MODE

V-CODE TRANSMISSION PROTOCOL FOR COMPUTER

- The computer sends two identical length-bytes (message length + 32); message length: 1 - 65 bytes; length byte value: 33 - 97.
- The computer awaits ACK. (If not received within 200 msec, repeats the mode select and tries again.)
- The computer sends the data, followed by a checksum, in the following format:
-----length----->
-----message-----> checksum
- The computer awaits ACK (if other than ACK received, repeats the mode select and tries again.)
ACK is returned after the message has been processed.
Thus, a time-out can only be used if the time taken to process the message is known.

Note: If, in the middle of a message, no character is received for at least 1 s, the player will time-out and send a NACK back.

V-CODE TRANSMISSION PROTOCOL FOR PLAYER

- The player sends two identical length-bytes (message length + 32); message length: 1 - 65 bytes; length byte value: 33 - 97.
- The player awaits ACK (if anything other than ACK received within 200 ms, the player will retry once. If nothing received within 200 ms transmission continues).

Note: Only available with the VP412

- The player sends the data, followed by a checksum, in the following format:
 $\xrightarrow{\text{length}} \xrightarrow{\text{message}} \xrightarrow{\text{checksum}}$
- The player waits ACK. (If anything other than ACK received within 200 msec, the player will retry the whole transmission once).

Message format

Data is sent as 8-bit bytes, with no modifications.

The checksum is the sum of all the data bytes modulo 256.

TOUCH SCREEN COMMUNICATION

Touch strings are generated by the touch screen facility and indicate which field on the screen has been used.

The VP412 can receive touch strings all the time but touch string data can only be used as an input for a running V-code program.

Touch screen communication is independent of, and does not influence the selected mode of communication or interface.

TOUCH SCREEN TRANSMISSION PROTOCOL

- The touch screen facility sends a string consisting of 4 bytes: start, x, y, end.
 start byte = 128 or 129.
 $x = \text{row } 0 \dots 23$
 $y = \text{column } 1 \dots 40$
 end byte = 142 or 143

TOUCH SCREEN RS 232-C INTERFACE

Touch screen communication strings can be sent to the player via the RS232-C bus (see below), the touch input bus or the IEEE-488 bus.

The touch input bus is a synchronous serial interface and uses the same 25 pin D-type connector as the RS232-C interface described later in this section. The touch input bus uses the following pins:

PIN	SIGNAL
11 (Rx/D2)	received data from the touch screen facility to player
18 (GND2)	logic ground
25 (DTR2)	data terminal ready: a signal from player to touch screen facility indicating the player is ready to receive data

DTR2 (DATA TERMINAL READY) PIN 25

Whenever the player is in a condition to receive data from the touch screen facility it signals this to the touch screen facility, by setting the DTR line to a high level ($> +3V$).

Conversely, when the player is busy processing data it is unable to receive data and indicates this to the touch screen facility by setting the DTR line to a negative level ($< -3V$).

It is important to ensure that the data output of the touch screen facility is accurately controlled by the DTR line so as to prevent partial loss of data.

DATA FORMAT

Data format is 8 data bits and 1 stop bit (parity ignored).

BAUD RATE SETTING

The data transmission speed is factory set at 9600 baud but may be altered to 1200 baud by moving a jumper on the internal control panel.

RS232-C/IEEE-488 INTERFACE SELECTION

Selection between the RS232 and IEEE-488 interfaces is by means of dip switch 4₄ (see fig. 1b). When the switch is in the 'up' position the



RS232 interface has been selected. When the switch is in the 'down' position the IEEE-488 interface has been selected. This selection does not affect touch screen communication, as this is possible at all times through either interface.

RS232-C INTERFACE CONNECTION

RS232-C INTERFACE CONNECTION

This is a serial computer interface, in accordance with international communication standards. Communication is full duplex, with a selectable baud rate.

Computer to player communication

The player is fitted with a 25-pole female D-type connector with the following pin connections:

PIN	SIGNAL
2 (Tx/D)	transmitted data from player to computer
3 (Rx/D)	received data from computer to player
5 (CTS)	clear to send: a signal from computer to player indicating the computer is ready to receive data
7 (GND)	logic ground
9	+12 V/100 mA
10	-12 V/10 mA
20 (DTR)	data terminal ready: a signal from player to computer indicating the player is ready to receive data

DTR (DATA TERMINAL READY) PIN 20

Whenever the player is in a condition to receive data from the computer it signals this to the computer, by setting the DTR line to a high level ($< +3V$).

Conversely, when the player is busy processing data it is unable to receive data and indicates this to the computer by setting the DTR line to a negative level ($< -3V$).

It is important to ensure that the data output of the computer is accurately controlled by the DTR line so as to prevent partial loss of data.

CTS (CLEAR TO SEND) PIN 5

On the serial interface of many computers there is a control line which may be used to tell the player when the computer is ready to receive data. Whenever the player wishes to transmit data back to the computer it first checks the status of the CTS line. If the CTS line is greater than +3 Volts the player assumes that the computer is ready to receive data, which is therefore transmitted.

If the CTS line is less than -3 Volts, the player delays transmission indefinitely until the correct CTS status is seen.

If the computer cannot control the CTS line, it is recommended that the 'Transmission delay on' 1 command is sent to the player. This results in a transmission rate of 50 characters per second, giving the computer more time to execute the characters. In this case the CTS line (pin 5) should be kept active (e.g. by leaving the connection open).

DATA FORMAT

Data format is 8 data bits and 1 stop bit (parity ignored).

BAUD RATE SETTING (Fig. 9)

Data transmission speed may be set to 1200/2400/4800/9600 baud according to the positions of the two baud rate dip switches (numbers 1 & 2) at the rear of the player.

- 1200 BAUD
- 9600 BAUD
- 2400 BAUD
- 4800 BAUD



Fig. 9: Baud rate dip switches

When altering the positions of these dip switches, it is useful to first switch on the 'player and disc status' display using the DISPLAY button on the remote control handset. The baud rate setting is then displayed on the screen.

IEEE-488 INTERFACE

INTRODUCTION

This point gives information about communication with the VP412 via an IEEE-488 interface bus.

SUPPORTED IEEE FACILITIES

The VP412 can act as a peripheral device for a computer system communicating via an IEEE-488 bus. The VP412 therefore supports the IEEE TALK and LISTEN functions and is not designed to be used as a CONTROLLER.

The listen mode is used for passing information on to the VP412 from a talking device on the bus, i.e. the host computer.

In the talk mode the VP412 passes information to the listeners on the bus. These listeners have to be assigned by the controller in charge and will often be (only) the controller itself.

The information to and from the player is structured in single or multiple byte messages, in IEEE bus terms: records. The VP412 transmit protocols use these records as a unit of information after which the communication can switch direction. The VP412 receive protocols neglect the size of the received records, they just wait for the number of bytes as directed by the protocol handled at that time.

To become a talker the VP412 requests for service and then supports serial polling. The VP412 does not request for service to become listener, a device wanting to talk to the VP412 must initiate the new configuration with itself as talker and the VP412 as listener.

INITIALISING THE VP412 AS AN IEEE DEVICE

Address setting

On the rear of the VP412 are the IEEE-488 interface address dip switches which are for selection in binary format of the IEEE-488 address. The position of the switches, at the moment of use, determines the bus address used by the VP412, for both talking and listening modes. Switch 1 is the least significant and switch 5 is the most significant switch, therefore, if all the switches are set "low" (i.e. binary 0) the address will be zero. Any address up to decimal 31 can be set using these switches.

When altering the positions of these dip switches, it is useful to first switch on the 'player and disc status' display using the DISPLAY button on the remote control handset. The address setting is then displayed on the screen.

USE OF INTERFACE SIGNALS AND COMMANDS

General interface management signals

In the communication between the controller and the VP412's IEEE interface adaptor, the control lines ATN, IFC, SRQ and EOI are

significant. These signals have rather well defined meanings in the IEEE-488 conventions and are used by the VP412 according to it. It may be useful however, to point out what actions and reactions the player can take or give in certain cases:

- At ATN active, the VP412 notifies the command mode on the bus.
- At IFC active, no change in the state of the VP412 is made, except that the talk and listen idle states of the bus interface are established.
- An EOI active received in data mode (with ATN false) will not influence the state of the VP412. The player continues waiting for more characters if the player's protocol so indicates. If the protocol indicates that no more characters are expected, any further characters will be regarded as part of a new string, regardless of EOI's. The IEEE record data structure is not the real basis for player inputs, but as long as the record size conforms to the selected protocol no problem will arise.
- In talk mode, the VP412 does use the IEEE record data structure correctly. Therefore all except the last byte in a transmitted string come without EOI and any last character in a string is sent with EOI. A listening device therefore has two options for handling inputs:
 - To put in complete records before processing the information, without the need to keep track with the player protocols for the number of bytes to receive.
 - To put bytes in, according to the player's protocols.
- SRQ is made active by the player for requests to become talker only. Host computers reaction of a serial poll is waited for, with a timeout of 10 s.

Message control

Messages transmitted to and from the VP412 must be in accordance with the VP412 protocols. In supporting these protocols, transmission of bytes via the IEEE bus follow the handshake procedure defined for IEEE bus communication in data mode.

In this communication process three hand-shake signals are used: NRFD, NDAC and DAV. The wait cycle for transitions of these signals made by the communication partners of the player are not limited in time. Only the wait cycle after a service request to become talker is limited to 10 s. The handshake used at byte output by the player does not have any timeouts.

The VP412 needs two services from the controller:

- Configure the VP412 as "talker": to be done after a service request from the player.
- Configure the VP412 as "listener": to be initiated by the computer.

The request of the VP412 to become "talker" uses the serial poll protocol as listed here:

- The VP412 makes the service request line active, the computer then places the system in serial poll mode.
- The computer eventually addresses the VP412 as a "talker" in the serial poll mode.
- The VP412 places the byte 'B010XXXX' on the data lines, where XXXXX is the player's bus address in binary.
- The computer ends the serial poll mode, and addresses the VP412 as talker in the data mode.

(If the player did not request for service and in serial poll mode it is addressed to talk, it will put a zero value on the data lines.)

Note: The player will not request service if it is already configured as a talking device on the bus.

The implementation of the protocols in a computer system intended for use with the IEEE-488 must be according to these protocols, with the following notes on the record structure of the IEEE:

- in mode select, as records are used:

'space', 'space'
'F'
'H'

Note: Only available with the VP412

"A" (positive acknowledge)

"N" (negative acknowledge)

- in F-code communication, as records are used:
data bytes, CR

- in the V-code communication, as records are used:
length byte, length byte
message, checksum byte

"A" (positive acknowledge)

"N" (negative acknowledge)

- in touch strings, as records are used:
startbyte, rowbyte, columnbyte, endbyte
(underscores: bytes with EOI, others without EOI)

IEEE-488 INTERFACE CONTACT LAYOUT

Contact	Signal Line	Contact	Signal Line
1	DIO 1	13	DIO 5
2	DIO 2	14	DIO 6
3	DIO 3	15	DIO 7
4	DIO 4	16	DIO 8
5	EOI	17	REN
6	DAV	18	Gnd, (6)
7	NRFD	19	Gnd, (7)
8	NDAC	20	Gnd, (8)
9	IFC	21	Gnd, (9)
10	SRQ	22	Gnd, (10)
11	ATN	23	Gnd, (11)
12	Shield	24	Gnd, Logic

Definitions

- ATN:** General Interface management bus line "Attention". The ATN Signal is generated by the active controller to indicate the transfer mode used. In command mode ATN = "True" and in data mode ATN = "False".
- DAV:** Handshake bus line "Data Value".
- DIO:** The "Data in-/Output" lines of the IEEE data bus.
- EOI:** General Interface management bus line "End or Identify".
- IFC:** General Interface management bus line "Interface clear".
- NDAC:** Handshake bus line "Not data accepted".
- NRFD:** Handshake bus line "Not ready for data".

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F-CODE PROGRAMMING

INTRODUCTION

The VP410/VP412 player is designed to allow control of all functions from an external computer. Connection to a computer is via the RS232-C serial interface or the IEEE-488 interface on the rear of the VP410/VP412.

The interface allows two-way communication between player and computer. Some commands sent to the player are followed by corresponding acknowledgements back to the computer.

If in the middle of an F-code string, no character is received for at least 1 s, the player times out and the already received characters will be lost.

COMMANDS TO THE PLAYER

The F-code commands that are sent to the player to carry out particular functions are listed in Tables 1 and 2.

Functional explanations of these commands are given in Section 6 'F-CODE COMMANDS'.

Table 2 lists acknowledgements sent from the player to the computer on receipt of certain commands.

PLAYER REGISTERS

There are two picture number registers in the player; each can hold a five-digit number from 1 to 79999.

Normally a disc can contain up to around 54 000 pictures (or frames) so numbers beyond this are not used. There is also a time code register which can store a time code of the form mm:ss in the range 00:00 to 99:59.

Picture number stop register

This register is automatically cleared to zero when the player reaches the picture number stored. The player then enters the still mode and an acknowledgement is sent back to the computer.

Picture number information register

When the player passes the number stored, an acknowledgement is sent back to the computer and the register is automatically cleared. The playing mode does not change.

Time code information register

When the player passes the time code stored, an acknowledgement is sent back to the computer and the register is automatically cleared. The playing mode does not change.

TABLE 1 - F-CODE COMMAND LIST

This table lists the necessary codes to be sent by the computer to the player in order to perform each function.

dec = decimal code
hex = hexadecimal code
chr = character

dec	hex	chr	function required
33	21	!xy	Sound insert (heep)
35	23	#xy	RC-5 command out via A/V EUROCONNECTOR
36	24	\$0	Replay switch disable
		\$1	Replay switch enable (default)
39	27	'	Eject (open the frontloader tray)
41	29	0	Transmission delay off
		1	Transmission delay on
42	2A	*	Halt (still mode)
		*xxxx+yy	Repetitive halt and jump forward
		*xxxx-yy	Repetitive halt and jump backward
43	2B	+yy	Instant jump forward yy tracks (max 50)
44	2C	0	Standby (unload)
		.1	On (load)
45	2D	-yy	Instant jump backward yy tracks (max 50)
47	2F	/	Pause (halt + all muted)
58	3A	:	Reset to default values
63	3F	?F	Picture number request
		?C	Chapter number request
		?D	Disc program status request
		?P	Player status request
		?U	User code request
64	40	@	Revision level request
		?=	Teletext direct string
65	41	A0	Audio-1 off
		A1	Audio-1 on (default)
66	42	B0	Audio-2 off
		B1	Audio-2 on (default)
67	43	C0	Chapter number display off (default)
		C1	Chapter number display on
68	44	D0	Picture number/time code display off (default)
		D1	Picture number/time code display on
69	45	E0	Video off
		E1	Video on (default)
70	46	FxxxxxI	Load picture number information register
		FxxxxxS	Load picture number stop register
		FxxxxxR	Goto picture number then Still mode
		FxxxxxN	Goto picture number then normal play forward
		FxxxxxQ	Goto picture number and continue previous play mode
72	48	H0	Remote control not routed to computer (default)
		H1	Remote control routed to computer
73	49	I0	Local front-panel buttons disabled
		I1	Local front-panel buttons enabled (default)
74	4A	J0	Remote control disabled for player control (default)
		J1	Remote control enabled for player control (default)
76	4C	L	Still forward
77	4D	M	Still reverse
78	4E	N	Normal play forward
		Nxxxxx+yy	Repetitive play forward and jump forward
		Nxxxxx-yy	Repetitive play forward and jump backward
		O	Play reverse
79	4F	Oxxxxx+yy	Repetitive play reverse and jump forward
		Oxxxxx-yy	Repetitive play reverse and jump reverse
81	51	QxxN	Goto chapter and play
		QxyzzS	Play chapter (sequence)
83	53	SxxxP	Set fast speed value, 2-40
		SxxxS	Set slow speed value, 2-250
84	54	T	Teletext (first characters in string)
		TxyxyN	Goto time code xx=min, yy=sec (yy=opt)
		TxyxyI	Load time code info register (yy=opt)
85	55	U	Slow motion forward
86	56	V	Slow motion reverse
87	57	W	Fast forward
88	58	X	Clear
90	5A	Z	Fast reverse
91	5B	[0]	Audio-1 from internal (default)
		[1]	Audio-1 from external
92	5C	[0]	Video from internal (default)
		[1]	Video from external
93	5D	[0]	Audio-2 from internal (default)
		[1]	Audio-2 from external
95	5F	-0	Teletext from disc off
		-1	Teletext from disc on (default)

Notes: 1. Each command must be terminated by a carriage return (CR).

2. Digits (x,y,z) must be in ASCII; leading zeros are optional.

Note: Only available with the VP412

TABLE 2 - ACKNOWLEDGEMENTS BACK TO EXTERNAL COMPUTER

On some F-code commands, the player will return a response code to the host computer. These are summarised below.

dec	hex	response syntax (ASCII)	description
79	4F	O	Returned when disc-tray is opened by an F-code command, or when disc-tray is open and a command which expects a response is received.
83	53	S	Ackn. on ON command when disc reaches correct speed.
61	3D	= x1 x2 x3 x4 x5	Returned after revision level request (?=).
70	46	F x1 x2 x3 x4 x5	Returned after picture number request command(?F).
67	43	C x1 x2	Returned after chapter number request command(?C).
68	44	D x1 x2 x3 x4 x5	Returned after disc status request command(?D).
80	50	P x1 x2 x3 x4 x5	Returned after player status request command(?P).
85	55	U x1 x2 x3 x4 x5	Returned after user code request command(?U).
88	58	X	Returned after ?F, ?C, ?D or ?U when the information is not available.
65	41	A 0	Acknowledgement on FxxxxR or FxxxxQ when completed.
		A 1	Acknowledgement on FxxxxN when completed.
		A 2	Acknowledgement on FxxxxS when stopped.
		A 3	Acknowledgement on FxxxxI when passed.
		A 6	Acknowledgement on QxxxN or QxxxR when completed.
		A 7	Acknowledgement on QxxxS when completed.
		A 8	Acknowledgement on TxxxN when completed.
		A 9	Acknowledgement on TxxxI when passed.
		A N	Negative acknowledgement: picture number, chapter number or time code in error.

Notes:

1. Each response is terminated by a carriage return (CR).
2. All response characters, including leading zeros, are sent.
3. Digits (x1...x5) are in ASCII.

TABLE 3 - F-CODE COMMANDS FROM REMOTE CONTROL HAND SET TO COMPUTER

Player commands from remote control handset when routed to host computer, after H1 command (RC to computer on), are of the form:

dec	hex	syntax
76	4C	L x

Where x is given by the following codes:

STANDBY	,
DISPLAY	!
NEXT	*
CLEAR	X
ENTER	P
START/REPEAT	F
AUDIO 1	A
AUDIO 2	B
CNR	R
PNR	D
CORR	C
GOTO	K
FAST ▶	W
FAST ◀	Z
SLOW ▶	T
SLOW ◀	U
SPEED +	H
SPEED -	G
TEXT	Y
PAUSE	V
SEARCH ▶	>
SEARCH ◀	<
STILL ▶	L
STILL ◀	M
PLAY ▶	N
PLAY ◀	O

Similarly, when an H1 command routes RC commands to the host computer, the numeric keys of the remote control handset, will give a response of the form:

dec	hex	syntax
86	56	V x

Where x is the key value in ASCII:

DIGIT 0	0
DIGIT 1	1
DIGIT 2	2
DIGIT 3	3
DIGIT 4	4
DIGIT 5	5
DIGIT 6	6
DIGIT 7	7
DIGIT 8	8
DIGIT 9	9

Note: Each response is terminated by a carriage return (CR).

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GOTO CHAPTER AND PLAY	39
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SLOW MOTION REVERSE	40
FAST FORWARD	40
FAST REVERSE	40
CLEAR	40
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AUDIO 1 FROM EXTERNAL	40
VIDEO FROM INTERNAL	40
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F-CODE COMMANDS

SOUND INSERT (beep)

Syntax: bx
First code: ! (33D = 21H)
Response: None
Function: To insert a beep tone in both audio channels

The values x and y range from 0 to 9 (in ASCII). x represents the pitch (although this is fixed in the VP410/VP412) and y represents the duration of the beep (approx. 0.5-5 sec).

The beep is not influenced by on/off switching of Audio channels 1 or 2, or the audio mute.

RC-5 OUTPUT VIA EUROCONNECTOR

Syntax: #xy
First code: # (35D = 23H)
Response: None
Function: The specified RC-5 command is transmitted via pin 8 of the Euroconnector, to control certain types of monitor.
The value x (40H - 5FH) defines the RC-5 system number (40H = system 0, 41H = system 1, etc.) and the value y (40H - 7FH) defines the RC-5 command number (40H = command 0, 41H = command 1, etc.).

REPLAY SWITCH DISABLE

Syntax: \$0
First code: \$ (36D = 24H)
Response: None
Function: To disable the REPLAY switch.

REPLAY SWITCH ENABLE

Syntax: \$1
First code: \$ (36D = 24H)
Response: None
Function: To enable the REPLAY switch.

This is the power-on default state. The replay function is only active if the REPLAY switch is ON AND it is ENABLED.

EJECT

Syntax: '
Code: ' (39D = 27H)
Response: 0 when tray is opened
Function: To stop the current action and open the disc-tray. The response is then given and the player goes to standby.

All defaults are reloaded (except for communication protocol video/audio from external switches and teletext from disc) and the stop and info registers are cleared.

TRANSMISSION DELAY OFF

Syntax:)0
First code:) (41D = 29H)
Response: None
Function: To switch the transmission delay off (default) when sending response characters from player.

This delay only affects the RS232-C bus.

TRANSMISSION DELAY ON

Syntax:)1
First code:) (41D = 29H)

Response: None
Function: To switch the transmission delay on when sending response characters from player.

This delay only affects the RS232-C bus. When the delay is on, response characters are sent at 20 ms intervals, resulting in a transmission rate of 50 characters per second. Such a delay may prevent loss of data if a host cannot control the handshake signal CTS (from the player) which must then be kept active continuously.

HALT (CAV only)

Syntax: *
Code: * (42D = 2AH)
Response: None
Function: Player enters still mode.

This command is not applicable to CLV discs.

HALT & JUMP FORWARD (CAV only)

Syntax: *xxxx+yy
Codes: * (42D = 2AH)
+ (43D = 2BH)
Response: None
Function: Still picture mode for duration xxxxx times 40 ms, followed by a jump forward over yy pictures.

The function is repeated until: another play mode command is received, a clear command is received, or lead-out is entered.

The following limits apply:

xxxxx > 0
yy = 1 ... 50 AND yy <= 20 X xxxxx

This command is not applicable to CLV discs.

HALT & JUMP REVERSE (CAV only)

Syntax: *xxxx-yy
Codes: * (42D = 2AH)
- (45D = 2DH)
Response: None
Function: Still picture mode for duration xxxxx times 40 ms, followed by a jump back over yy pictures.

The function is repeated until: another play mode command is received, a clear command is received, or lead-in is entered.

The following limits apply:

xxxxx > 0
yy = 1 ... 50 AND yy <= 20 X xxxxx

This command is not applicable to CLV discs.

INSTANT JUMP FORWARD

Syntax: +yy
First code: + (43D = 2BH)
Response: None
Function: Jump forward over yy pictures.

The jump is performed at the end of a video field. Small jumps are invisible, as they can be performed within the video blanking.

After this command, the player continues its previous operation.

The following limits apply:

yy = 1 ... 50

INSTANT JUMP REVERSE

Syntax: -yy
First code: - (45D = 2DH)
Response: None
Function: Jump back over yy pictures.

The jump is performed at the end of a video field. Small jumps are invisible, as they can be performed within the video blanking.

After this command, the player continues its previous operation.

The following limits apply:
yy = 1...50

STANDBY

Syntax: ,0
First code: , (44D = 2CH)
Response: None
Function: Enter standby condition.

The spinning motor is decelerated and the optical readout unit goes to 'lead-in' (home position). The player is then switched to standby. All defaults are reloaded except for communication protocol, video/audio from Internal/External and TXT from disc on/off. The STOP and INFO registers are cleared.

ON

Syntax: ,1
First code: , (44D = 2CH)
Response: Positive ack: S
Negative ack: O (if disc-tray is open)
Function: CAV - Display first picture
CLV - Start play

CAV disc: The player is started and goes to the first picture after lead-in (still mode). The positive acknowledge signal is then given.

CLV disc: The player is started and goes to the first time code after lead-in. The positive acknowledge signal is then given and normal play forward commences.

If the player is already on, this command performs a Goto the first picture, the positive acknowledge signal is given and then still (CAV) or play (CLV) occurs.

PAUSE

Syntax: /
Code: / (47D = 2FH)
Response: None
Function: CAV - Enter still mode with audio and video muted
CLV - Pause, audio and video muted (optical readout unit stays in current position)

RESET TO DEFAULT

Syntax: :
Code: : (58D = 3AH)
Response: None
Function: Reset to initial conditions.

The player is reset to initial power-on conditions, except that the communication protocol remains unchanged. The STOP and INFO registers are not affected.

PICTURE NUMBER REQUEST (CAV only)

Syntax: 7F
Codes: ? (63D = 3FH)
F (70D = 46H)

Response: Positive ack: Fxxxx
Negative ack:
X if picture no. is not available
O if disc-tray is open
Function: To return the current picture number as five ASCII digits (00001...99999).

If this command is attempted when a CLV disc is loaded, a negative acknowledge signal (X) is returned.

CHAPTER NUMBER REQUEST

Syntax: 7C
Codes: ? (63D = 3FH)
C (67D = 43H)
Response: Positive ack: Cxx
Negative ack:
X if chapter no. is not available
O if disc-tray is open
Function: To return the current chapter number as two ASCII digits (00...79).

DISC PROGRAM STATUS REQUEST

Syntax: ?D
Codes: ? (63D = 3FH)
D (68D = 44H)
Response: Positive ack: D x1 x2 x3 x4 x5
Negative ack:
X if disc status not available
O if disc-tray is open
Function: To return the disc program status (as recorded on the disc).

Each status byte (x1 to x5) is in the form 0011yyyyy.
These bytes are specified below:

Response specification

First status byte (x1)

bit 7:	0
bit 6:	0
bit 5:	1
bit 4:	1
bits 3-0:	1101 = D (Hex)
or	
bits 3-0:	1011 = 11 (Hex)

Second status byte (x2)

bit 7:	0
bit 6:	0
bit 5:	1
bit 4:	1
bits 3-0:	1100 = C (Hex)
or	
bits 3-0:	1010 = A (Hex)

From x1 and x2:

DC = CX noise reduction present
BA = No CX noise reduction

Third status byte (x3)

bit 7:	0	
bit 6:	0	
bit 5:	1	
bit 4:	1	
bit 3:	0 = 12" disc	1 = 8" disc
bit 2:	0 = side 1	1 = side 2
bit 1:	0 = no TXT present	1 = TXT present
bit 0:	0 = FM-FM mpx. off	1 = FM-FM mpx. on

Fourth status byte (x4)

bit 7:	0
bit 6:	0
bit 5:	1
bit 4:	1
bit 3:	0 = no program dump 1 = program dump in audio channel 2
bit 2:	0 = normal video 1 = video contains digital information
bit 1:	(see table below)
bit 0:	(see table below)

Fifth status byte (x5)

bit 7:	0
bit 6:	0
bit 5:	1
bit 4:	1
bit 3:	even parity check with bits 3, 2 & 0 of x4
bit 2:	even parity check with bits 3, 1 & 0 of x4
bit 1:	even parity check with bits 2, 1 & 0 of x4
bit 0:	0

x4 bit 3, x3 bit 0, x4 bit 1 and x4 bit 0 (respectively in the table below) indicate the status of the analogue audio channels:

	program dump	FM multiplex	channel 1	channel 2
0000	off	off	stereo	
0001	off	off	mono	
0010	off	off	no sound carriers	
0011	off	off	bilingual	
0100	off	on	stereo	stereo
0101	off	on	stereo	bilingual
0110	off	on	cross-channel stereo	
0111	off	on	bilingual	bilingual
1000	on	off	mono	dump
1001	on	off	mono	dump
1010	on	off	(for future use)	
1011	on	off	mono	dump
1100	on	on	stereo	dump
1101	on	on	stereo	dump
1110	on	on	bilingual	dump
1111	on	on	bilingual	dump

PLAYER STATUS REQUEST

Syntax: ?P
Codes: ? (63D = 3FH)
P (80D = 50H)
Response: Positive ack: P x1 x2 x3 x4 x5
Negative ack: 0 if disc-tray is open
Function: To return the player status.

Each status byte (x1 to x5) is in the form 01yyyyyy, where y represents a status bit. The status bytes are specified below. Zero status bits are reserved for future use.

Response specification

First status byte (x1)

bit 7:	0
bit 6:	1
bit 5:	1 = normal mode (loaded)
bit 4:	0
bit 3:	0
bit 2:	1 = chapter play
bit 1:	1 = Goto action
bit 0:	1 = Goto action

Second status byte (x2)

bit 7:	0
bit 6:	1
bit 5:	0
bit 4:	0
bit 3:	0
bit 2:	1 = chapter numbers exist on disc
bit 1:	1 = CLV detected
bit 0:	1 = CAV detected

Third status byte (x3)

bit 7:	0
bit 6:	1
bit 5:	0
bit 4:	0
bit 3:	0
bit 2:	1 = replay function active (switch is on and enabled)
bit 1:	0
bit 0:	1 = frame lock

Fourth status byte (x4)

bit 7:	0
bit 6:	1
bit 5:	0
bit 4:	1 = RS232-C transmission delay (50 char/s)
bit 3:	1 = Remote control handset enabled for player control
bit 2:	1 = Remote control commands routed to computer
bit 1:	1 = Local front-panel controls enabled
bit 0:	0

Fifth status byte (x5)

bit 7:	0
bit 6:	1
bit 5:	1 = audio channel 2 enabled
bit 4:	1 = audio channel 1 enabled
bit 3:	1 = TXT from disc enabled
bit 2:	0
bit 1:	0
bit 0:	0

USER CODE REQUEST

Syntax: ?U
Codes: ? (63D = 3FH)
U (85D = 55H)
Response: Positive ack: U x1 x2 x3 x4 x5
Negative ack: X if user code not available
O if disc-tray open
Function: To return the user code, as recorded on the disc.

One line of user code is read during lead-in at player start-up. This is saved for subsequent requests.

Each status byte (x1 to x5) has the following form:
001yyyyy (y = status bit).

The status bits (in Hex) are:
x1: 0...7
x2: D
x3, x4, x5: 0...F

REVISION LEVEL REQUEST

Syntax: ?=
Codes: ? (63D = 3FH)
= (61D = 3DH)
Response: Positive ack: x1 x2 x3 x4 x5
Function: To return the player firmware revision level.

The response bytes x1 to x5 are made up of ASCII digits.

x1 = 0
x2 = major revision level of drive software
x3 = minor revision level of drive software
x4 = major revision level of control software
x5 = minor revision level of control software

TELETEXT DIRECT STRING

Syntax: @
Response: None
Function: This is the first character of a TXT direct string. A direct string specifies one TXT row.
Remarks: See section 7, "TELETEXT OPERATION" for further information.

AUDIO 1 OFF

Syntax: A0
First code: A (65D = 41H)
Response: None
Function: Disable internal audio channel 1 (from disc)

If audio channel 2 is on, both audio outputs are supplied by audio channel 2.

AUDIO 1 ON

Syntax: A1
First code: A (65D = 41H)
Response: None
Function: Enable internal audio channel 1 (from disc)

This is the power-on default state. Audio is on only during normal play forward.

AUDIO 2 OFF

Syntax: B0
First code: B (66D = 42H)
Response: None
Function: Disable internal audio channel 2 (from disc)

If audio channel 1 is on, both audio outputs are supplied by audio channel 1.

AUDIO 2 ON

Syntax: B1
First code: B (66D = 42H)
Response: None
Function: Enable internal audio channel 2 (from disc)

This is the power-on default state. Audio is on only during normal play forward.

CHAPTER NUMBER DISPLAY OFF

Syntax: C0
First code: C (67D = 43H)
Response: None
Function: Cancel chapter number display.

This is the power-on default state.

CHAPTER NUMBER DISPLAY ON

Syntax: C1
First code: C (67D = 43H)
Response: None
Function: Display chapter number on screen.

This is disabled during lead-in/lead-out and during Goto.

PICTURE NUMBER/TIME CODE DISPLAY OFF

Syntax: D0
First code: D (68D = 44H)
Response: None

Function: CAV - Cancel picture number display CLV - Cancel time code display

This is the power-on default state.

PICTURE NUMBER/TIME CODE DISPLAY ON

Syntax: D1
First code: D (68D = 44H)
Response: None
Function: CAV - Display picture number on screen
CLV - Display time code on screen

This is disabled during lead-in/lead-out and during Goto.

VIDEO OFF

Syntax: E0
First code: E (69D = 45H)
Response: None
Function: Switch off internal video (from disc)

VIDEO ON

Syntax: E1
First code: E (69D = 45H)
Response: None
Function: Switch on internal video (from disc)

This is the power-on default state. The video is also switched off by the player when not in the active area of the disc, or when pause, ready or Goto are active.

LOAD PICTURE NUMBER INFO REGISTER (CAV only)

Syntax: FxxxxxI
Codes: F (70D = 46H)
I (73D = 49H)
Response: Positive ack: A3
Negative ack: AN if CLV disc
O if disc-tray is open
Function: The positive acknowledge signal is given when the specified picture number is passed by any play or step action.

The INFO register is cleared after the response.

If a CLV disc is loaded, the negative acknowledge (AN) will be given.

LOAD PICTURE NUMBER STOP REGISTER (CAV only)

Syntax: FxxxxxS
Codes: F (70D = 46H)
S (83D = 53H)
Response: Positive ack: A2
Negative ack: AN if CLV disc
O if disc-tray is open
Function: The player halts at the specified picture number when reached by any play or step action. The positive acknowledge signal is then given.

The STOP register is cleared after the response.

If a CLV disc is loaded, the negative acknowledge (AN) will be given.

GOTO PICTURE NUMBER AND HALT (CAV only)

Syntax: FxxxxxR
Codes: F (70D = 46H)
R (82D = 52H)
Response: Positive ack: A0
Negative ack: AN if Goto fails
O if disc-tray is open
Function: Search for picture number and display in still mode.

The specified picture is searched for. When found, the picture is displayed in still mode and the positive acknowledge signal is given. If the picture number is not found, the negative response (AN) is given. During the Goto action, the audio and video are muted. However, the video is not muted if the Goto can be performed within the instant jump region of 50 tracks.

If a CLV disc is loaded, the negative acknowledge signal (AN) is returned.

GOTO PICTURE NUMBER AND PLAY (CAV only)

Syntax: FxxxxxN
Codes: F (70D = 46H)
 N (78D = 4EH)
Response: Positive ack: A1
 Negative ack:
 AN if Goto fails
 O if disc-tray is open
Function: Search for picture number and commence play from that picture number.

The specified picture is searched for. When found, normal play forward commences from that picture and the positive acknowledge signal is given. If the picture number is not found, the negative response (AN) is given. During the Goto action, the audio and video are muted. However, the video is not muted if the Goto can be performed within the instant jump region of 50 tracks.

If a CLV disc is loaded, the negative acknowledge signal (AN) is returned.

GOTO PICTURE NUMBER AND CONTINUE (CAV only)

Syntax: FxxxxxQ
Codes: F (70D = 46H)
 Q (81D = 51H)
Response: Positive ack: A0
 Negative ack: AN if Goto fails
 O if disc-tray is open

Function: Search for picture number and continue with previous play mode from that picture number.

The specified picture is searched for. When found, the previous play mode continues from that picture and the positive acknowledge signal is given. If the picture number is not found, the negative response (AN) is given. During the Goto action, the audio and video are muted. However, the video is not muted if the Goto can be performed within the instant jump region of 50 tracks.

If a CLV disc is loaded, the negative acknowledge signal (AN) is returned.

RC TO COMPUTER OFF

Syntax: H0
First code: H (72D = 48H)
Response: None
Function: Remote control commands NOT routed to host computer.

This is the power-on default state.

RC TO COMPUTER ON

Syntax: H1
First code: H (72D = 48H)
Response: None
Function: Remote control commands routed to host computer.

Only one response is given for each RC command. See table 3 in section 5, "F-CODE PROGRAMMING", for further information.

LOCAL CONTROL OFF

Syntax: I0
First code: I (73D = 49H)
Response: None
Function: Disable player front-panel controls.

LOCAL CONTROL ON

Syntax: I1
First code: I (73D = 49H)
Response: None
Function: Enable player front-panel controls.

This is the power-on default state.

REMOTE CONTROL OFF

Syntax: J0
First code: J (74D = 4AH)
Response: None
Function: RC commands NOT executed by player.

REMOTE CONTROL ON

Syntax: J1
First code: J (74D = 4AH)
Response: None
Function: RC commands executed by player.

This is the power-on default state.

STILL FORWARD (CAV only)

Syntax: L
Code: L (76D = 4CH)
Response: None
Function: Halt and display next picture.

The time between two subsequent still commands (forward or reverse) must be at least 40 ms to be sure of execution. This command is not applicable to CLV discs.

STILL REVERSE (CAV only)

Syntax: M
Code: M (77D = 4DH)
Response: None
Function: Halt and display previous picture.

The time between two subsequent still commands (forward or reverse) must be at least 40 ms to be sure of execution. This command is not applicable to CLV discs.

PLAY FORWARD

Syntax: N
Code: N (78D = 4EH)
Response: None
Function: Normal play forward.

PLAY FORWARD AND JUMP FORWARD (CAV only)

Syntax: Nxxxxx+yy
Codes: N (78D = 4EH)
 + (43D = 2BH)
Response: None
Function: After normal play forward of xxxxx pictures, a jump forward of yy pictures is performed.

This is repeated until a Clear command or another play mode command is received, or lead-out is reached. The following limits apply:

xxxxx>0

yy = 1...50

yy <= 20 X xxxxx

This command is not applicable to CLV discs.

PLAY FORWARD AND JUMP REVERSE (CAV only)

Syntax: Nxxxx-yy

Code: N (78D = 4EH)
-(45D = 2DH)

Response: None

Function: After normal play forward of xxxxx pictures, a jump back of yy pictures is performed.

This is repeated until a Clear command or another play mode command is received, or lead-in or lead-out is reached.

The following limits apply:

xxxxx>0

yy = 1...50

yy <= 20 X xxxxx

This command is not applicable to CLV discs.

PLAY REVERSE (CAV only)

Syntax: O

Code: O (79D = 4FH)

Response: None

Function: Normal play reverse.

This command is not applicable to CLV discs.

PLAY REVERSE AND JUMP FORWARD (CAV only)

Syntax: Oxxxx-yy

Code: O (79D = 4FH)
+ (43D = 2BH)

Response: None

Function: After normal play reverse of xxxxx pictures, a jump forward of yy pictures is performed.

This is repeated until a Clear command or another play mode command is received, or lead-in/lead-out is reached.

The following limits apply:

xxxxx > 0

yy = 1...50

yy <= 20 X xxxxx

This command is not applicable to CLV discs.

PLAY REVERSE AND JUMP REVERSE (CAV only)

Syntax: Oxxxx-yy

Code: O (79D = 4FH)
-(45D = 2DH)

Response: None

Function: After normal play reverse of xxxxx pictures, a jump back of yy pictures is performed.

This is repeated until a Clear command or another play mode command is received, or lead-in is reached.

The following limits apply:

xxxxx > 0

yy = 1...50

yy <= 20 X xxxxx

This command is not applicable to CLV discs.

GOTO CHAPTER AND HALT

Syntax: QxxR

Code: Q (81D = 51H)
R (82D = 52H)

Response: Positive ack:

A6

Negative ack: AN if Goto fails

O if disc-tray is open

Function: Search for start of specified chapter and display first picture.

When found, the first picture of the chapter is displayed and the positive acknowledge signal is given. Video and audio are muted during goto.

Note: With CLV discs, play starts at that chapter.

GOTO CHAPTER AND PLAY

Syntax: QxxN

Code: Q (81D = 51H)
N (78D = 4EH)

Response: Positive ack:

A6

Negative ack: AN if Goto fails

O if disc-tray is open

Function: Search for start of specified chapter and commence play.

Following a successful search, normal play forward starts from the first picture of the chapter and the positive acknowledge signal is given. If the search fails, the negative response (AN) is given. Video and audio are muted during the Goto.

PLAY CHAPTER (SEQUENCE)

Syntax: QxyyyzS

Code: Q (81D = 51H)
S (83D = 53H)

Response: Positive ack:

A7

Negative ack: AN if Goto fails

O if disc-tray is open

Function: Play the specified chapter or sequence of chapters.

The start of the first specified chapter is searched for. When found, this chapter is played (normal play forward). When the end of the chapter is reached, the next specified chapter is searched for, and played, etc., until the last specified chapter has been played.

The positive ack. signal is then given and the player either halts (CAV) or enters pause mode (CLV).

A maximum of 7 chapters is allowed in a sequence. If more than one chapter is specified, two digits per chapter must be specified.

e.g. Q3S plays chapter 3
Q0312S plays chapter 3 then 12

■ a chapter search fails, a negative ack. signal is given and the chapter sequence is terminated.

During a Goto, the video and audio are muted.

SET FAST SPEED (CAV only)

Syntax: SxxxF

Code: S (83D = 53H)
F (70D = 46H)

Response: None

Function: Fast speed is set to the specified value.

Limits: xxx = 2...40

where 2 is normal speed

3 is 3/2 times normal speed

40 is 40/2 (i.e. 20) times normal speed.

The default value is 6, i.e. 3 times normal speed.

Fast play action is initiated with command W for forward, or command Z for reverse.

This command is not applicable to CLV discs.

SET SLOW SPEED (CAV only)

Syntax: SxxxS

Code: S (83D = 53H)

Response: None

Function: Slow speed is set to the specified value.

Limits: xxx = 2...250

where 2 is normal speed

3 is 2/3 times normal speed

250 is 2/250 times normal speed (i.e. 5 sec per picture)

The default value is 6, i.e. 1/3 normal speed.

Slow play action is initiated with command U for forward, or command V for reverse.

For compatibility reasons, the command Sxxx is equivalent to SxxxS.

This command is not applicable to CLV discs.

TELETEXT STRING

Syntax: T/

Response: None

Function: These are the first characters in an encoded teletext string or command.

Remarks: See section 7, "TELETEXT OPERATION" for further information.

GOTO TIME CODE (CLV only)

Syntax: TxxxyN

Codes: T (84D = 54H)

N (78D = 4EH)

Response: Positive ack: A8

Negative ack: AN if Goto fails

O if disc-tray is open

Function: The specified time code is searched for and when found, normal play forward is performed.

When the specified time code is found, the positive acknowledge signal is given. If the time code is not found then the negative response is given. xx defines the minutes, and yy the seconds. Minutes are mandatory, and the seconds are optional. If the seconds are specified, the minutes must be given as a two digit number e.g. 07.

If the seconds are not specified, or a disc without line 16 manchester code is played, a search to the start of the specified minute is performed.

If performed with CAV discs, the negative response (AN) is given.

LOAD TIME CODE INFO REGISTER (CLV only)

Syntax: TxxyyI

Codes: T (84D = 54H)

I (73D = 49H)

Response: Positive ack: A9

Negative ack: AN if CAV disc

O if disc-tray is open

Function: The positive acknowledge signal is given when the specified time code is passed during normal play forward.

xx defines the minutes, yy the seconds. The minutes are mandatory, the seconds are optional. If the seconds are specified, the minutes must be given as a two digit number e.g. 07.

If the seconds are not specified or a disc without line 16 manchester code is played, the acknowledge signal appears on the first second of the specified minute.

If performed with CAV discs, the negative ack. signal (AN) will be returned immediately.

SLOW MOTION FORWARD (CAV only)

Syntax: U

Code: U (85D = 55H)

Response: None

Function: Play forward at slow speed is started, conforming to the SxxxS setting.

This command is not applicable to CLV discs.

SLOW MOTION REVERSE (CAV only)

Syntax: V

Code: V (86D = 56H)

Response: None

Function: Play reverse at slow speed is started conforming to the SxxxS setting.

This command is not applicable to CLV discs.

FAST FORWARD (CAV only)

Syntax: W

Code: W (87D = 57H)

Response: None

Function: Play forward at fast speed is started conforming to the SxxxF setting.

This command is not applicable to CLV discs.

FAST REVERSE (CAV only)

Syntax: Z

Code: Z (90H = 5AH)

Response: None

Function: Play reverse at fast speed is started conforming to the SxxxF setting.

This command is not applicable to CLV discs.

CLEAR

Syntax: X

Code: X (88D = 58H)

Response: None

Function: CAV: Any play action is stopped and the player is put into still mode. A chapter play (sequence) is cancelled. The picture number INFO and STOP registers will be cleared.

CLV: Any chapter play (sequence) is cancelled.

The timecode INFO and STOP registers will be cleared.

The cancelled chapter play (sequence) does not send a response to the host computer.

AUDIO 1 FROM INTERNAL

Syntax: [0]

First code: [(91D = 5BH)

Response: None

Function: The internal audio 1 signal is selected.

This is the power-on default state.

AUDIO 1 FROM EXTERNAL

Syntax: [1]

First code: [(91D = 5BH)

Response: None

Function: The internal audio 1 signal is inhibited in favour of the audio source on the audio 1 input connector.

The audio 1 on/off switch and the audio 1 mute do not have a function in this mode.

VIDEO FROM INTERNAL

Syntax: \0

First code: \[(92D = 5CH)

Response: None
Function: The internal video signal is selected.

This is the power-on default state.

VIDEO FROM EXTERNAL

Syntax: \1
First code: \ (92D = 5CH)
Response: None
Function: The internal video signal is inhibited in favour of the external video source on the CVBS video input connector.

The video on/off switch and the video mute do not have a function in this mode.

AUDIO 2 FROM INTERNAL

Syntax: |0
First code: | (93D = 5DH)
Response: None
Function: The internal audio 2 signal is selected.

This is the power-on default state.

AUDIO 2 FROM EXTERNAL

Syntax: |1
First code: | (93D = 5DH)
Response: None
Function: The internal audio 2 signal is inhibited in favour of the audio source on the audio 2 input connector.

The audio 2 on/off switch and the audio 2 mute do not have a function in this mode.

TXT FROM DISC OFF

Syntax: .0
First code: . (95D = 5FH)
Response: None
Function: The video lines that may contain teletext information are muted (internal video signal from LV-disc or external CVBS).

TXT FROM DISC ON

Syntax: .1
First code: . (95D = 5FH)
Response: None
Function: The teletext information in the raster blanking lines of the internal video signal (LV-disc or external CVBS) is enabled.

This is the power-on default state.

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TELETEXT OPERATION

INTRODUCTION

The VP412 player is fitted with the Teletext facility which can generate teletext text and graphics. The teletext encoder can be addressed from an external computer via the RS232, IEEE-488 interfaces or by a V-code program. Teletext may be displayed against either a black or against a normal video background. In the latter case, there are two possibilities:

- The text itself is contained within a boxed background which may be either black or coloured;
- The text is overlaid on the picture without a boxed background using the mixing facility.

Both teletext text (i.e. alphanumeric characters) and graphics (shapes based upon a 2 x 3 matrix) may be produced, as with normal broadcast teletext. Desired graphic characters are produced by transmitting the appropriate ASCII codes.

INDIRECT AND DIRECT TELETEXT

Two modes of teletext transmission from computer to player are possible.

- **Indirect teletext** has a straightforward command structure, comprising control characters for text and graphics generation. The length of an indirect teletext string is determined by the number of control codes and amount of text used.
- **Direct teletext** has been developed to allow simple interfacing with a videodata system, in that an indirect command string is always 43 bytes long, irrespective of the number of control codes sent.

All commands from the computer relating to indirect teletext are prefixed with **T/**. Commands relating to direct teletext are prefixed with **@** symbol. This ensures that such commands are internally addressed to the teletext decoder.

Before transmitting any text or graphics the computer must send a Header Command. This tells the (teletext) decoder in the television set or monitor whether a black video background is required, and also whether or not to erase any previous text from its memory.

If desired, the teletext page number (which is also keyed into the TV receiver) may be selected, before transmitting text. Page 100 is normally used as most teletext receivers default to this page number when first switched to teletext. The player also defaults to this page number unless another page number is specified.

Before sending teletext commands from the computer, the TV receiver should be switched to either text or mixing mode. It is not necessary to have a disc playing in order to display teletext.

INDIRECT TELETEXT

It is important to note when sending a teletext string that the following rules apply:

"/" generally should precede a control code. "@" acts as a 'toggle' for the control codes and text. The first "@" signifies text, all characters following this will alternate between control and text codes, respectively.

The following commands CANNOT be sent as part of a text string:

PAGE SELECTION

T/Pxxx

e.g. page 100 T/P100

This command selects the teletext page on which text will appear. xxx represents a 3-digit page number between 100 and 899. Default condition: - Page 100 is selected.

HEADER COMMANDS

A Header Command must be sent to the player before any text is transmitted:

T/HBL

This command erases old teletext information from the encoder's memory and gives a black video background.

T/HBN

Similar to command T/HBL, but without erasing the old teletext.

T/HCL

This gives a normal video background, with overlaid text. Old teletext information will be erased.
(Start-Box command must be used - see example 6).

T/HCN

Similar to T/HCL, but without erasing the old teletext.

The following commands must be sent as part of a text string:

ROW COMMANDS

T/Rxx

It is necessary to specify on which row number text is required: xx represents any row between 01 and 23. A 2-digit row number must always be used.
e.g. R05
or R18

This command must be the first code in each text string.

SPACE COMMANDS

xx

If a block or more than 1 space is required anywhere in a row, then instead of putting many such spaces into the required text, the command xx can be used where xx is a 2-digit number between 01 and 39. The 2-digit number represents the number of spaces in the block (see examples).

Example 1

First send Header Command T/HBL

Then send:

T/R08@TEXT@

T Addresses command to the teletext encoder

/ Separates control codes

R Signifies that following 2 digits are a row number

08 Row number

@ All characters between the @ symbols will actually appear on screen

TEXT Characters to be displayed

The above example will produce the word TEXT in white letters, against the left hand margin, 8 rows down from the top of the screen.

Example 2

T/R08/06@TEXT@

Same as example 1 but word TEXT is now 6 spaces in from left hand margin.

Note the use of / to separate control codes.

For further control commands see table.

Example 3

T/R12/10/CG@INFORMATION@

Additional control code CG (colour green) means that the word INFORMATION is displayed in green.

Example 4

T/R15/02/CY@TELETEXT@0

5@INFORMATION@

The control code 05 between the @ symbols causes the word INFORMATION to be displayed 5 spaces along from the word TELETEXT.

Example 5

T/R11/03/CR@TELETEXT@C
Y@INFORMATION@

The control code CY between the @ symbols will change the colour from red to yellow, between the word TELETEXT and INFORMATION.

If as well as CY, the control code FL is also used (CY/FL) then the word INFORMATION will flash.

Example 6

If we now send a new Header Command: T/HCL, the text will now be superimposed over the video from the disc. It is now necessary to use SB (Start Box) and EB (End Box) control codes unless the TV set is in mixed mode.

Header Command T/HCL

T/R10/SB@VIDEO@EB/

SB Start Box indicates start of box background

EB End Box indicates end of box background.

Example 7

T/R05/CY/NB/SB/CR@INFOR
MATION@EB/

CY followed by NB (New Background) indicates a yellow background. CR following NB indicates colour of actual text.

The example produces the word INFORMATION in red against a yellow box background.

Example 8

T/R08/CR/DH/06/SB@ANSW
ER@CD@LONDON@EB/

This gives the word ANSWER in red, double-height (DH) letters.

The word LONDON is displayed only after the 'Reveal' button of the teletext TV handset is pressed.

Example 9

T/R06/CW/NB/CR/DH/09/F
L/SB@SELECT@ST/02@BUTT
ON@EB/

This gives the word SELECT flashing in blue, double-height letters, against a white background, followed by the non-flashing word BUTTON.

TELETEXT GRAPHICS

A simple example of an indirect teletext string using graphics is shown below:

Example: To draw the outline of a green square on a black video background.

Send the following:

T/HBL

T/R07/GG/15@7@#@#@#@#@

T/R08/GG/15@5@0.5@1@

T/R09/GG/15@3@0.5@1@

T/R10/GG/15@upppppz@

GG means Graphics Green

upppppz these alpha/numeric characters have ASCII values which correspond to the appropriate graphic characters shown in "Broadcast Teletext Specifications".

Teletext control commands

- DH = Double Height
- NH = Normal Height
- FL = Flashing Character
- ST = Steady Character
- SB = Start Box
- EB = End Box
- CR = Colour Red
- CG = Colour Green
- CY = Colour Yellow
- CB = Colour Blue

CM = Colour Magenta

CC = Colour Cyan

CW = Colour White

GR = Graphics Red

GG = Graphics Green

GY = Graphics Yellow

GB = Graphics Blue

GM = Graphics Magenta

GC = Graphics Cyan

GW = Graphics White

SG = Separated Graphics

HG = Hold Graphics

* RG = Release Graphics

* NG = Normal (contiguous) Graphics

* BB = Black Background

NB = New Background

CD = Conceal Display

Note:

* These control characters are assumed to be in each new row. Any control character will remain in force until the end of the row or until superseded by a new control character.

All characters except SB and EB occupy one character space. SB and EB occupy 2 spaces.

DIRECT TELETEXT

Direct string teletext is very similar in structure to broadcast teletext and viewdata. This similarity allows such strings to be transmitted through a viewdata network.

The direct string is always 43 bytes long.

The first byte = decimal 64 and this tells the player to expect a direct string. The next byte is the magazine number, and this includes information as to whether the text is to appear on an odd or even row.

Magazine 1 = pages 100 to 199

Magazine 2 = pages 200 to 299

up to

Magazine 8 = pages 800 to 899

The third byte is the row address (row number).

The remaining bytes (to make a total of 43 bytes) are sent as teletext codes, e.g.:

ASCII-code 13 = Double-Height

ASCII-code 1 = Colour Red

It is not possible to give all details of the broadcast teletext system in this manual. The applicable information is contained in "Broadcast Teletext Specification", published jointly by the BBC, IBA and BREMA.

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MAINTENANCE

CARE OF THE PLAYER

The player requires no special maintenance. It is, however, advisable to clean the objective lens from time to time with a piece of wadding dipped in alcohol.

CARE OF DISCS

No special care is needed in handling discs.

For best results however, you are recommended to keep the playing surface clean and free from dust, grease, etc. When cleaning is required, gently wipe the disc surface with a soft, dry cloth. Use no solvents!

Always remove discs after playing, replacing them in their protective jackets.

Discs should be stored vertically, in their original jackets. Keep them away from extreme heat or moisture and avoid exposure to direct sunlight.

The player is designed and constructed to play LV-discs even when they are somewhat scratched and dusty. In those cases the picture quality will be reduced and some additional noise may be heard from the focusing mechanism.

FAULT SYMPTOMS AND POSSIBLE CAUSES

Disc does not rotate, no indicators light up

- Automatic overload protection circuit is in operation. Switch off the player at the rear, wait for approx. 30 seconds then switch on again.

Disc does not rotate

- Check that the player is receiving power: the **STANDBY** indicator should be lit.
- Check that the disc-tray is properly closed.

Disc rotates but picture is weak or absent

- Check the connection between monitor and player.
- Check that the disc has been loaded correctly (label up) on the disc-tray. (Some discs have programme content on one side only.)
- Press the > section of the **SEARCH** button.
- The player is in the pause mode: Press the > section of the **PLAY** button.

Player sticks at particular point on disc

- Press the > section of the **SEARCH** button momentarily to skip over the affected part.
- Remove the disc and wipe both surfaces clean with a soft, dry cloth to remove possible opaque surface marks.

Special effects (still, slow, reverse, fast) do not function

- Check that a CAV disc is being played; when playing CLV discs, the special-effects buttons do not function.

Unstable still picture

- If still pictures taken from a fast moving scene sometimes flicker, this is no fault of the player but results from the basic programme material used for disc production.

Good picture but no sound

- Make sure that the player is in its forward playing mode (in all other modes there is no sound).
- Check that the sound channels **AUDIO 1** and/or **AUDIO 2** are switched on (the indicators should be lit).
- If an LV-ROM disc is being played, there may be data and therefore no sound on the disc. Try a non-LV-ROM disc.

Digit buttons are inoperative

- Check whether the picture number or chapter number is displayed on the monitor. If not, press **PNR** or **CNR**.

Remote control does not function correctly

- Check that the **RC IR/EURO** switch on the rear of the player is set to **IR**.
- Make sure that the distance between player and remote control handset is not more than 10 m.
- Make sure that remote control handset is aimed at the front of the player and there is no obstacle between player and remote control handset.
- Check batteries in remote control handset.
- If the player is in the **Replay** mode, most controls are disabled.

The player fails to respond when under computer control

- Check the connections to the relevant interface.
- Ensure that **DATA IN** and **DATA OUT** are the right way around (**RS232-C**).
- Check that the **DTR** signal from the player is being received by the computer (**RS232-C**).
- To reset, press the **ON/STANDBY** button on the front of the player.

TECHNICAL DATA

LASERVISION DISC

Disc diameter	30 cm (12") or 20 cm (8")
Disc thickness	2.7 mm (0.1")
Disc speed	CAV disc: 1500 r.p.m. CLV disc: 1500-570 r.p.m.
Maximum capacity (30 cm - 12" disc)	CAV disc: 54 000 pictures per side
Max. playing time (30 cm - 12" disc)	CAV disc: 36 minutes per side CLV disc: 1 hour per side
Average track pitch	1.6 - 1.8 μ m

PROFESSIONAL LASERVISION PLAYER VP410/VP412

General

Front loading motor-powered disc-tray

startup time	< 13 s
unload time (time between Eject command and disc out of player)	< 15 s

SSL (solid state laser)

Laser type	AlGaAs semiconductor
Wavelength	780 nm
Aperture	0.5
Output of laser	3 - 5 mW

Random access time CAV: average less than 1 s. max 3 s

CLV: 5 s average. 15 s max

Instant jump Up to 50 pictures, forward or reverse

On-board programming Up to 16 picture number/time code segments and up to 16 chapter segments

Program retention

with no mains supply > 1 week

Mains voltage 220 to 240 V a.c. ($\pm 10\%$).

Mains frequency 50 to 60 Hz

Power consumption 50 W approx.

Electrical safety acc. to IEC 65

operational conditions 10 to 35 deg C

Rel. humidity 20 to 80%

storage conditions -40 to 70 deg C

Rel. humidity 10 to 95%

Dimensions	420 x 120 x 400 mm
disc-tray open	420 x 120 x 740 mm
Weight	14 kg (approx.)
TV system	625/50 PAL
Video	
CVBS input (BNC)	1 V into 75 ohm, loop-through
CVBS output (BNC)	1 V into 75 ohm
CVBS output (Euroconnector pin 19)	1 V into 75 ohm
RGB output (Euroconnector)	
R (pin 15)	0.7 V into 75 ohm
G (pin 11)	"
B (pin 7)	"
Video bandwidth	RGB: 5 MHz (-3 dB) CVBS: 3 MHz (-3 dB), encoded
Signal-to-noise ratio	40 dB typ. unweighted (disc dependent) 50 dB typ. weighted (disc dependent)
Timebase instability	less than 10 ns (normal play)

Audio

Audio input (cinch)	3 Vpp (load 47 k)
Audio output (cinch)	650 mV r.m.s. into 1 k (max. deviation)
Audio output (Euroconnector pins 1 & 3)	650 mV r.m.s. into 1 k
Audio bandwidth	40-20 000 Hz
Signal-to-noise ratio	>= 50 dB typ. weighted (disc dependent)
Channel separation	better than 55 dB

Genlock

Sync input (BNC)	0.3-2.0 Vpp 75 ohm, loop-through (waveform acc. to CCIR standards)
Sync output (BNC)	2.0 Vpp, 75 Ohm negative going.
Genlock lock-in time	2 s

A/V Euroconnector

pin	signal
1	audio out (right) 650 mV rms/1 k
2	not connected
3	audio out (left) 650 mV rms/1 k
4	audio earth
5	blue earth
6	not connected
7	blue out 700 mV/75 ohm
8	RC-5 in/out; player status 12V.
9	green earth
10	not connected
11	green out 700 mV/75 ohm
12	not connected
13	red earth
14	D-B earth
15	red out 700 mV/75 ohm
16	fast blanking: 2.5 V into 75 ohm (RGB status)
17	CVBS earth
18	RGB status earth
19	CVBS out 1 V/75 ohm (also acts as sync out when using RGB)
20	not connected
21	socket earth

RS232-C interface

Serial computer interface, in accordance with international communication standards.

Full duplex

1200/2400/4800/9600 baud (selectable)
8 data bits, 1 stop bit, no parity

The player is fitted with a 25-pole female D-connector with the following pin connections:

pin	signal
2 (Tx/D)	transmitted data from player to computer
3 (Rx/D)	received data from computer to player
5 (CTS)	clear to send: a signal from computer to player indicating the computer is ready to receive data (>= +3 V means O.K. to transmit)
7 (GND)	logic ground
9	+12 V/100 mA
10	-12 V/10 mA
20 (DTR)	data terminal ready: a signal from player to computer indicating that player is ready to receive data (>= +3 V means O.K. for data)

Touch screen input bus

Serial computer interface, in accordance with international communication standards, using spare pins on the standard 25 pin D-type connector.

Simplex, only player inputs.

Default baud rate (factory set) 9600; selectable to 1200 baud
8 data bits, 1 stop bit, no parity

pin	signal
11 (Rx/D2)	received data from the touch screen facility to player
18 (GND2)	logic ground
25 (DTR2)	data terminal ready: a signal from player to touch screen facility indicating the player is ready to receive data

IEEE-488 interface contact layout

Contact	Signal Line	Contact	Signal Line
1	DIO 1	13	DIO 5
2	DIO 2	14	DIO 6
3	DIO 3	15	DIO 7
4	DIO 4	16	DIO 8
5	EOI	17	REN
6	DAV	18	Gnd., (6)
7	NRF D	19	Gnd., (7)
8	NDAC	20	Gnd., (8)
9	IFC	21	Gnd., (9)
10	SRO	22	Gnd., (10)
11	ATN	23	Gnd., (11)
12	Shield	24	Gnd., Logic

Definitions

ATN:	General Interface management bus line "Attention". The ATN Signal is generated by the active controller to indicate the transfer mode used. In command mode ATN = "True" and in data mode ATN = "False".
DAV:	Handshake bus line "Data Value".
DIO:	The "Data in/Output" lines of the IEEE data bus.
EOI:	General Interface management bus line "End or Identify".
IFC:	General Interface management bus line "Interface clear".
NDAC:	Handshake bus line "Not data accepted".
NRF D:	Handshake bus line "Not ready for data".

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V-CODE PROGRAMMING

INTRODUCTION

V-code is a low level programming language, dedicated to LaserVision applications.

The VP412 player includes a V-code interpreter (3.0) and program memory, that enables it to run a V-code program without use of an external computer.

Features:

- Laservision player control
- Teletext display
- Alpha/numeric input from keyboard
- Touch screen
- Input and output via communication port (host computer)
- Programmable interrupt
- Stack manipulation
- Simple arithmetic
- Structured program flow control

V-code is a stack oriented language.

Parameter passing and temporary storage of operands is performed via a data stack. For subroutine nesting on address stack is applied. The top value is used as the instruction pointer.

The stack-width is 16 bit.

The stack-depth is 96 (data + address stack).

The available depth on one stack depends on the occupied space in the other.

Stack under- or overflow terminate the V-code program execution and a warning beep of 2 sec is given.

All V-code instructions are one byte long (opcode).

For most instructions, one or more parameters must be passed on the data stack ('reverse polish notation').

DEFINITIONS

data stack	= parameters
address stack	= subroutine return addresses
stack width	= 16 bit
stack depth	= 96 (data + address stack)
mnem	= mnemonic
opc	= opcode (hexadecimal)
stack before	= data stack before execution (top is to the right)
stack after	= data stack after execution (top is to the right)
addr	= memory address
n	= picture number (binary) or time code (high byte = minutes; low byte = seconds)
m	= 16 bit unsigned integer
b	= single byte (high byte = 0)
c	= ASCII character value (high 9 bits = true)
f	= Boolean flag (zero = false, non-zero = true)

- When an instruction is executed, the specified parameters before execution are dropped and the parameters after execution are put onto the stack. The stack operations will always be carried out even if the instruction is illegal (e.g. GTIME with a CAV disc).
- For the 2 byte values in memory, the byte priority is high byte first.
- A character string in memory is terminated by 8FH.

V-CODE INSTRUCTIONS

V-code instructions are described on the following pages. The first line of the instruction shows the following: the instruction symbol (mnemonic), the opcode in hexadecimal, the stack before and the stack after the instruction is carried out. In this notation the top of the stack is on the right-hand side.

LASERVISION PLAYER CONTROLS

PLAYU op: 50H bef: n aft:

Normal play with automatic stop.

Start playing from current picture number.

The player automatically stops at the picture number on stack.

The play direction is forward when the stop picture number is higher than the start number; otherwise, reverse play is started.

This instruction does not wait for the autostop.

(WAITA is intended for this function).

SLOWU op: 53H bef: n,b aft:

Slow play with automatic stop (CAV only).

This instruction is as PLAYU except for the playing speed.

The top stack value defines the speed, the second value the stop number.

Theoretical speed value range = 2-250 (twice the number of revolutions per picture).

Power ON default speed value = 6

This instruction does not wait for the autostop.

(WAITA is intended for this function).

FASTU op: 46H bef: n,b aft:

Fast play with automatic stop (CAV only).

This instruction is equal to PLAYU except for the playing speed.

The top stack value defines the speed, the 2nd value the stop-no.

Speed value range = 2-250 (twice the number of pictures per revolution).

Speed values higher than 40 will be accepted as 40. Power ON default speed value = 6

This instruction does not wait for the autostop.

(WAITA is intended for this function).

PLAYCH op: 68H bef: b aft:

Fast access to the first picture of the specified chapter followed by a play until the first picture of the next chapter.

Then still picture (CAV) or pause (CLV) is performed. During the access action, video and audio are muted. This instruction does not wait for the autostop (WAITA is intended for this function).

The chapter number range = 0..79

RAU op: 47H bef: n aft:

Fast access to the picture number on top of the stack (CAV only).

During this action, video and audio are muted.

If the GOTO instruction can be performed within the instant jump span of 50 tracks the video is not muted (instant access).

GTIME op: 67H bef: n aft:

Fast access to the time code (CLV), specified on top of stack, followed by play forward.

During the access action, video and audio are muted.

Stack format (binary):

minutes (0..255)	seconds (0..59)
(ms-byte)	(ls-byte)

SSF op: 3EH bef: aft:

Single step forward (CAV only).

Halts any play action, if underway

SSR op: 3CH bef: aft:

Single step reverse (CAV only).
Holds any play action, if underway

STOP op: 73H bef: aft:

Stop playing (still picture CAV); pause (CLV).

CONT op: 61H bef: aft:

Continue previous play action.

RAP op: 3FH bef: aft: n

Read actual picture number (CAV) or time code (CLV). Time code is as specified in GTIME. This number is put on top of the stack.

WAITA op: 41H bef: aft:

Awaits an automatic stop (initialised by PLAYU, PLAYCH, SLOWU, or FASTU). This instruction is ignored when the player is in the STILL or PAUSE mode.

WAITU op: 75H bef: n aft:

Waits until the picture number on top of the stack is passed during the current play action.
The instruction is ignored when passing is impossible (already passed, wrong playing direction or still picture).

OPEN op: 5EH bef: aft:

The spinning motor is decelerated and the actuator goes to 'lead in' (home position). Then the front loader tray is opened and the player goes to standby.

All default switch positions are reloaded except for external audio, video and teletext from disc (see ON/OFF instruction). The communication protocol is unaffected.

IDENT op: 79H bef: aft: u, f

If the LV-disc has been loaded (manchestercode readable), the top of stack is made true and the usercode, as recorded on LV-disc (lead-in), is put on the second stack position (if not available, a zero is put on the stack).

If a disc is not loaded, the top of stack is made false and the second stack value gives the frontloader tray position: tray outside = zero, tray inside = non zero.

User code stack format (binary):

x1: x3: x4: x5:
ms-nibble ls-nibble

x1 = 2nd nibble of manchester code (value 0..7)

x3..x5 = 4th..6th nibble of manchester code (value 0..F)

The 3rd nibble (x2) is not returned because of its fixed value of D (hex).

ON op: 4FH bef: u aft:

Switch on.

The functions to be switched on are defined by top of stack value.

Each bit (of 16) selects one switch function.

A bit value of 1 switches on the corresponding function, the other functions (bit = 0) remain unchanged.

OFF op: 51H bef: u aft:

Switch off.

The functions to be switched off are defined by top of stack value.

Each bit (of 16) selects one switch function. A bit value of 1 switches off the corresponding function, the other functions (bit = 0) remain unchanged.

ON/OFF switch functions (u)

bit	decimal function	default	remarks
0	1 video	on	
1	2 audio 1	on	
2	4 audio 2	on	
3	8 local control	off	
4	16 Remote to V-code	on	remote control
5	32 picture number	off	
6	64 chapter number	off	
7	128 TXT from disc	off	
8	256 TXT background	on	TXT function
9	512 video from external	off	
10	1024 audio 1 from external	off	
11	2048 audio 2 from external	off	
12	4096 TXT mixmode	off	TXT function

Notes

- Remote control on → Remote control input to player disabled
- Remote control input to V-code enabled.
- Remote control off → Remote keyboard controls the player.
- Remote control input to V-code disabled
- TXT from disc off → TXT from program is switched on.
- Video from ext. on → Internal video is disabled.
- Audio from ext. on → Internal audio is disabled.
- TXT mixmode off → Normal teletext mode.

DATA STACK

DUP op: 64H bef: u1 aft: u1, u1

Duplicate the value on the top of the stack.

DROP op: 78H bef: u aft:

Drop the top value from the stack.

A stack underflow terminates program execution.

SWAP op: 5AH bef: u1, u2 aft: u2, u1

Exchange the top two stack values.

OVER op: 6FH bef: u1, u2 aft: u1, u2, u1

Copy the second stack value, placing it as the new top.

ROT op: 59H bef: u1, u2, u3 aft: u2, u3, u1

Rotate the top three stack values, bringing the third to the top.

SHIFT op: 5CH bef: u1, b aft: u2

Shift the second stack value to left or right. The number of bits to be shifted and the shift direction are specified by the top-of-stack value:
0 - 15 = shift left 0 - 15 bits respectively.
16 - 31 = shift right 0 - 15 bits respectively.

LD0 op: 30H bef: aft: 0

LD1 op: 31H bef: aft: 1

LD2 op: 32H bef: aft: 2

LD3 op: 33H bef: aft: 3

LD4 op: 34H bef: aft: 4

LD5 op: 35H bef: aft: 5

LD6 op: 36H bef: aft: 6

LD7 op: 37H bef: aft: 7

LD8 op: 38H bef: aft: 8

LD9 op: 39H bef: aft: 9

The BCD equivalent of the opcode (30-39) is put on top of the stack.

1.BYTE op: 27H bef: aft: b

The next program byte is put on top of the stack (high byte = 0).

LWORD op: 22H bef: aft: u

The next two program bytes are put on top of the stack (16 bits).

First byte = High byte.

Second byte = Low byte.

Arithmetic (data stack)

ADD op: 2BH bef: u1 u2 aft: sum f

Addition of the top two stack values.

The sum and a boolean flag are left on stack.

A true flag indicates value overflow (sum > 65535).

SUB op: 2DH bef: u1 u2 aft: diff f

Subtract top of stack from second stack value.

The difference (u1-u2) and a boolean flag are left on stack.

A true flag indicates a negative result (diff < 0).

NOT op: 2FH bef: f1 aft: f2

Boolean complement.

A 'true' on top of stack is made 'false' and vice-versa.

(zero = 'false', non-zero = 'true').

Comparison (data stack)

EQUAL op: 3DH bef: u1 u2 aft: f

Comparison of top two stack values.

The top two stack values are replaced by a boolean flag.

A true flag indicates that the values are equal.

LEQ op: 2CH bef: u1 u2 aft: f

Comparison of top two stack values.

The top two stack values are replaced by a boolean flag.

A true flag indicates that the second value (u1) is equal to or less than

the top value (u2).

ADDRESS STACK

RETN op: 40H bef: aft:

Drop top of address stack (return from subroutine).

A stack underflow terminates program execution.

POP op: 60H bef: aft:

Pop second address stack value.

START op: 2AH bef: aft:

Pop all except top value from address stack, so a return from the current routine is not possible.

Drop all values from data stack.

INPUTS

KEYBOARD INPUT

DIGIT op: 4EH bef: b1 aft: b2

Awaits the next available digit from keyboard.

(remote must be switched ON).

All characters except the specified digit keys are ignored.

On top of stack the upper limit (1-9) has to be specified.

Input digit zero and digits higher than the limit are ignored.

The BCD value of the input digit is put on stack.

When a previously displayed text string has not been terminated, the

(value) input digit is displayed.

KEY op: 4BH bef: aft: c

Awaits the next available character from keyboard.

The ASCII value of the input character is put on stack.

When a previously displayed text string has not been terminated, the input character is displayed.

BNF op: 4AH bef: b aft: m

Awaits next available digits from keyboard.

The input is terminated by a carriage return or enter key.

All characters except the digit keys, backspace, correction, enter and carriage return are ignored.

On top of stack the input field-width (1-5) must be specified.

A field-width of zero skips this instruction (zero result on stack).

A field-width of 5 or higher is defaulted to 4 or 5 (depending on first

input digit). The maximum input value is 59999.

The input value is put on stack in binary.

When a previously displayed text string has not been terminated, the

field-width is displayed by dots, which are replaced by the input digits.

At text line overflow, the field-width is reduced to fit in the current line.

STRING op: 77H bef: b aft: adr

Awaits next available character string from keyboard.

The input is terminated by a carriage return.

On top of stack the input field-width (1 to 31) must be specified.

A field-width higher than 31 is defaulted to 31.

The input string is put in memory (including the termination byte 8FH).

The memory address is left on top of stack.

When a previously displayed text string has not been terminated, the

field-width is displayed by dots, which are replaced by the input digits.

At text line overflow, the field-width is reduced to fit in the current line.

ENINT op: 45H bef: c aft:

Enable interrupt by a specified input from keyboard (single key). The

key that causes an interrupt is on top of stack (ASCII value). The next

two bytes in the program specify the address of the interrupt service routine.

An interrupt will only be serviced in a wait instruction (WAIT, WAITA, and WAITU) or the INM instruction.

Note: It is advisable in the interrupt routine that there are no wait instructions to avoid nested interrupts. Alternatively, the interrupt can be disabled by using ENINT with a non-existent key value.

TOUCH SCREEN INPUT

Definitions

The touch grid is equal to the teletext grid:-

24 rows (0-23); 40 columns (1-40)

A touch field can be formed by one or more rows and columns.

A 'touch string' contains one or more touch fields.

Each field in a touch string has the same size which is specified by the first two bytes (height = ΔR , width = ΔC). The fields are specified by the row and column number of the top left corner of the field. The string is terminated by 8FH.

Touch string (R = row number, C = column number):

$\Delta R \Delta C$	R1 C1	R2 C2, ..., Rn Cn
Size	Field 1	Field 2 Field n

TOUCH op: 74H bef: adr aft: u

Awaits next available input from touch screen.

The address on the stack refers to a touch string in memory. If the touched field matches with one of the fields specified in the touch string, the corresponding position number in the string is returned on stack.

If field 1 is touched, a one is returned. Field 2 returns a two, etc...
A mismatch returns a zero on stack.

ENTI op: 69H **bef:** adr **aft:**

Enable interrupt by a specified input from touch screen.
The touch field(s) that causes the interrupt has to be specified in a touch string whose address is on top of stack.
All specified fields will cause an interrupt.
The next two bytes in the program specify the address of the interrupt service routine. An interrupt will only be serviced in a wait instruction (WAIT, WAITA, and WAITU) or the INM instruction.

Note:

It is advisable in the interrupt routine that there are no wait instructions to avoid nested interrupts. Alternatively, the interrupt can be disabled by using ENTI with an empty touch string.

GENERAL INPUT

TIMOUT op: 71H **bef:** u **aft:**

Enable a time-out for all input instructions.
This time-out is valid until it is disabled.
The top stack value specifies the time-out in tenths of a second.
A zero value will disable the time-out.
The next two bytes in the program specify the address of the routine that is called after time-out (time-out routine).
When a time-out has been enabled, an input instruction will quit, if after the time specified by the TIMOUT instruction, no input has been given. After time-out, the input instructions return the values:
DIGIT 0 (on stack)
BINI 0 (on stack)
KEY 8FH (on stack)
STRING empty string (8FH) in memory
TOUCH 0 (on stack)
INM empty string (8FH) in memory

After time-out, the program continues with the time-out routine. Returning from this routine, the program is continued just after the input instruction.

RS232/IEEE-488 INPUT

INM op: 2EH **bef:** aft: adr

Awaits next available character string, sent by host computer (RS232/IEEE-488) according to the selected protocol.
The input string is put in memory (plus byte 8FH as terminator). On top of stack the memory address (of 1st character) is left. The maximum length of the input string is 31, more characters will be lost.
An interrupt (enabled by ENINT or ENTI) or time out (see TIMOUT instruction) will terminate the INM instruction, then an empty string will be returned.

MEMORY ACCESS

LOAD op: 3AH **bef:** u **adr:** u

The memory address on top of the stack is replaced by its contents (2-byte value).

STORE op: 3BH **bef:** u **adr:** aft:

The second stack value (2-byte) is stored in memory.
The memory address is specified on top of the stack.

COMP op: 56H **bef:** adr1 **adr2:** aft:

Comparison of two character strings in memory.
Both strings must include a termination byte (8FH).
If the strings match, a boolean true is put on stack, if they do not match, a boolean false is left. The comparison is not case sensitive. The string at address 2 may contain 'wild characters':
* in the middle of a 'word': matches any character except space
* at the end of a 'word': matches any or no character
% as first character of a single 'word': causes true comparison when this 'word' is contained in the other string.

Note: A space is the 'word' delimiter.

Wild character examples

string 1 (addr1)	string 2 (addr2)	match
taipay	ta'p**	true
taypei	ta'p**	true
taipe	ta'p**	true
tapei	ta'p**	false
fresh air	%air	true
airport	%air	false

MOVE op: 4DH **bef:** adr1 **adr2:** aft:

Copy a string in memory up to and including the string terminator (8FH), byte by byte beginning at address 1, into memory beginning at address 2.

OUTPUT

SOUND op: 76H **bef:** b **aft:**

A sound signal is generated via the audio channels.
The duration of the signal is specified on top of the stack in the range of 0..9 (0.5...5 sec). Values higher than 9 are treated as having the value 9.

OUTS op: 21H **bef:** u **aft:**

The top stack-value (16-bit binary number; high byte first) is sent to a host computer via RS232C or IEEE-488 (depending on which has been selected).

OUTM op: 25H **bef:** adr **aft:**

A character string in memory (address on stack) is sent to a host computer, via RS232C or IEEE-488 (depending on which has been selected). The maximum string length is 64 characters.

OUTRC op: 72H **bef:** u **aft:**

The top stack value is sent, according to the RC5 protocol, via pin 8 of the smart connector. The RC5 toggle bit will be the inverse value of this bit in the preceding RC5 output

Stack format (binary):

000S SSSS: 00CC CCCC

ms-byte	ls-byte
bit 0..5	(C) = command-no (value 0..63)
bit 6,7	(I) = is reversed value 0
bit 8..12	(S) = subsystem-no (value 0..31)
bit 11	(T) = toggle bit (value 0 or 1)
bit 13...15	(R) = reserved (value 0)

TELETEXT

WRSUB op: 26H bef: adr1 aft: adr2.b

Display a character string whose address is in on top of the stack, until either the substitution byte 8CH or the termination byte 8FH is encountered.

A substitution byte is followed by a field-width byte (1-31).

Ending this instruction via a substitution byte leaves the field-width on top and the address of the following text byte on second stack position. Ending this instruction via a termination byte leaves a zero on top and the address of the termination byte on second stack position.

WRITE op: 28H bef: adr aft:

Display a character string whose address is in on top of the stack.

The string is terminated by 8FH.

Substitution bytes and subsequent field-width are ignored.

After a WRITE or WRSUB instruction the text display is opened and any keyboard input or text output will be displayed. This function is disabled by the TERM instruction.

SPACES op: 20H bef: u aft:

Display spaces in current text line.

The number of spaces is defined on the stack.

Text line overflow terminates this instruction.

A terminated text skips this instruction.

EMIT op: 65H bef: c aft:

Display single character whose ASCII value is on stack, in current text line.

A terminated text skips this instruction.

BINO op: 6AH bef: u aft:

Display a number (binary value on stack) in current text line.

A terminated text skips this instruction.

TERM op: 29H bef: aft:

Terminate current text line.

CLEAR op: 63H bef: aft:

Erase teletext page.

PAGE op: 70H bef: u aft:

Select teletext page to be used for transmission to TXT-decoder.

The page number is specified on top of the stack.

When the page number is out of range (100-899), the teletext transmission page = 100.

Default page number = 100.

String control bytes (Hex)

AOH = space suppression (followed by number of spaces in binary)

80H = new row (followed by row number in binary)

8CH = substitution point (followed by field width in binary)

8FH = string terminator

TEXT STRING SPECIFICATION

One character is coded by one byte. The least significant 7 bits must conform to the "Broadcast Teletext Specifications".

The most-significant bit codes a preceding space (1 = space). The normal space character need not be used (but could be).

A consecutive number of spaces may be coded in two bytes.

The first byte is AOH, the second byte defines the number of spaces.

Text line overflow terminates the display of spaces.

A text string may be longer than one text line.

A byte 80H terminates a line, the next byte specifies the new row number (binary).

At text line overflow, the line is terminated. The current string is skipped until the next 80H byte.

The text string is terminated by 8FH.

Display of substituted strings (e.g. with STRING, BIN1, BINO) is possible by using the WRSUB instruction.

A substitution byte 8CH followed by a field-width byte (binary) defines the substitution point in the text.

Substitution bytes encountered after line overflow and before next new row-byte return a field-width of zero on the stack.

The field-width is useful for input (BIN1, STRING).

After substitution, display of the text string can be continued with the WRITE or WRSUB instructions.

PROGRAM FLOW CONTROL

DO op: 44H bef: u1.u2 aft:

Subroutine call + initialisation for repetition.

The second stack value defines a loop limit, the top value defines a loop index.

Both values are saved and are used by the LOOP instruction.

Up to 16 levels of loop nesting are allowed.

The subroutine address is specified by the next two bytes in the program.

LOOP op: 4CH bef: aft:

The latest saved loop index is incremented and compared with the corresponding loop limit. If the index is lower than the limit, a subroutine call is performed using the previous two program bytes as subroutine address.

Returning from this subroutine, the execution of the LOOP instruction is repeated.

An index equal to or higher than the limit terminates the loop, the loop parameters are lost and the program continues with the next instruction.

INDEX op: 58H bef: u aft:

Make the top of the data stack equal to the current loop index.

LEAVE op: 6CH bef: aft:

Equates the current loop index to the corresponding limit.

IF op: 49H bef: f aft:

Conditional subroutine call based on a boolean on top of the stack.

The next four program bytes specify two subroutine addresses, the first address is valid for 'true' on stack, the second one for a 'false'.

CASE op: 43H bef: b1.b2 aft:

Conditional subroutine call based on the second stack value.

The top of the stack defines the number of addresses following the CASE instruction. The second stack position contains the sequence number of the address to be used for the subroutine call. If this sequence number is out of range (higher than top of stack), no subroutine call is performed.

BEGIN op: 42H bef: aft:

Unconditional subroutine call.

The subroutine address is specified by the next two bytes in the program.

UNIL op: 55H bef: f aft:

Conditional branch based on a boolean on top of the stack.

A 'false' branches 3 bytes backwards in the program.

A 'true' continues with the next opcode.

This instruction is intended to be used in conjunction with BEGIN.

WHILE op: 57H bef: f aft:

Conditional subroutine call based on a boolean on top of the stack.

The next two bytes specify a subroutine address, to be called if the top of the stack is 'true'. A 'false' skips both the subroutine call and the next opcode in the program.

REPEAT op: 52H bef: aft:

Unconditional branch of 3 bytes backwards in the program.

This instruction is intended to be used in conjunction with WHILE.

MARK op: 6DH bef: aft:

The current data and address stack is saved.

Two save memories are implemented.

Only the two last-saved stacks are valid.

BACKW op: 62H bef: b aft:

Reload data and address stack from save memory.

If top of stack = 1 (or lower) the last saved stack is loaded.

If top of stack = 2 (or higher) the previous saved stack is loaded.

The re-loaded stack is now considered to be the last saved one.

This instruction causes a jump back in the program without destroying the subroutine nesting structure.

EXIT op: 5FH bef: aft:

Stop execution of the program. Manual player control is initiated.

MISCELLANEOUS

WAIT op: 54H bef: u aft:

Halt program execution for a specified time.

This time is specified in tenths of a second, on top of the stack.

LPROG op: 24H bef: aft:

New additional 'program dump' from Laservision disc.

Next two bytes in program specify the memory load address.

Normal play forward is started.

After finishing the dump, the program execution continues at the address specified by the first two bytes of the new program (part).

If the dump-file cannot be loaded (timeout = 10 s) the program continues with the next instruction.

During dump, Audio-1 is unaffected and Audio-2 is switched off.

After dump, play forward continues and Audio-2 remains off.

The LPROG instruction is intended to be used for loading a complete new program (load address = 0).

The dump-file structure is the same as the initial dump-file.

CONFIG op: 7AH bef: b aft:

Selects the communication protocol for RS232/IEEE-488 buses.

The top stack value defines the desired protocol for the OUTM, OUTS and INM instructions.

A value of 0 results in F-code, a value of 1 in V-code protocol. Other values are reserved.

Note that the player does not send a mode selection to the host. See

section 4. "INTERACTIVE OPERATION/COMMUNICATION" for further information.

OVLY op: 23H bef: aft:

Overlay 'program dump' from LaserVision disc.

Next two bytes in program specify the memory load address.

Normal play forward is started.

After finishing the 'program dump', the code loaded is executed as if called by a BEGIN instruction (i.e. the load address is pushed on the address stack).

If the dump-file cannot be loaded the program continues with the next instruction.

During dump, Audio-1 is unaffected and Audio-2 is switched off.

After dump, play forward continues and Audio-2 remains off.

The overlays are fully relocatable and main program independent. The dump-file structure differs from a first dump (or LPROG dump). The OVLY is most useful for exchange of data tables, text strings etc. Outer table, variables and control program remain in memory.

V-CODE PROGRAM FILE

A V-code program consists of:

- An outer table
- Variable data (optional)
- V-code instructions
- Text strings (optional)

The first part (starting at address 0) of a program must be the outer table comprising a minimum of 1 and a maximum of 128 addresses. (All reference addresses are relative to zero.) The first address points to the start of the V-code program (mandatory).

The next table entries are addresses of user-defined subroutines (optional).

Subroutines may be called by just one byte (80H - FFH) which refers to the appropriate address in the outer table, so an unconditional subroutine call can be done in two ways:

- Via the instruction BEGIN (followed by the subroutine address).
- Via the opcodes 80H - FFH (reference to outer table address).

Note: The V-code instruction opcodes 00H - 7FH refer to another address table (part of the V-code interpreter).

THE INTERACTIVE LASERVISION AUTHORIZING SYSTEM (ILVAS)

The Interactive LaserVision Authorizing System (ILVAS) is specifically designed to minimise the task of preparing V-code program files. This software package can be used in conjunction with a personal computer such as the P3200 and provides the following features: a high level language, program/text editing facility, simulation and management tools for the creation of V-code programs. For further information contact your local Philips sales office.

TOUCHSCREEN FACILITY

When a V-code program running in the VP412 uses touch-input facilities, the data from the touch-screen TV set is received via the RS232, IEEE 488 or touch screen input buses.

This communication is independent of the selected communication mode.

A touch data string consists of 4 bytes: startbyte, X, Y, end (decimal)

startbyte = 128 or 129

X = row 0..23

Y = column 1..40

endbyte = 142 or 143

The startbyte value may change between 128 and 129 at each new touch to supply 'toggle' information.

COMMUNICATION COMMANDS FOR V-CODE MODE

SATELLITE COMMANDS

Some V-code instructions are used to control the VP412 via the RS232 or IEEE-488 bus. These instructions are defined as satellite (player) commands.

These commands can be sent separately or in a command-string, which may be up to 64 bytes. Nesting of command-strings is not possible.

Any operand must be transferred before use, by means of LBYTE or LWORD.

Numbers have to be in binary form and after execution of a command string, the player sends an acknowledge (ACK).

For all commands except RAP and IDENT, the acknowledge is a single ACK or NACK.

RAP or IDENT are only allowed as a single command.

Ack on RAP: P pp (pp: picture number in binary code; most significant number first).

Ack on IDENT: I ff uu (ff: two byte flag, uu: two byte user code/tray position)

These two Acks are sent according to the V-code communication protocol.

List of satellite command mnemonics

```
LBYTE PLAYU LWORD RAU FASTU SLOWU SSF
SSR STOP CONT RAP OPEN PLAYCH IDENT
GTIME OUTRC SOUND WAITA WAITU ON OFF
START PAGE CLEAR
```

TELETEXT STRINGS

Teletext lines transferred to the VP412 in satellite mode must be according to the following rules:

- format: 80H, <row-numbers>, <text-lines>.
- <text-line> may be in either teletext- or V-code-format.
- both single and double SB/EB is allowed.
- only one line can be transferred at a time.
- maximum length of any transfer is 48 characters.
- substitution bytes (and subsequent field-width) are ignored.
- an acknowledge (41H) is returned to the host-computer when the text-string has been displayed.

Note: To change one teletext character in current (latest transmitted) text-line, send: 81H, <position-number>, <new character>
Position-number = position in latest transmitted text-line to be changed (1-40).

Only allowed as single command.

PROGRAM DUMP

These commands may not form part of a command string.

- 'Host computer program dump' start command sets program dump address to 16-bit value given, in the format:
DDH, "Start address-high byte"; "Start address, low byte"
- 'Host computer program dump' continuation command treats data as program dump, stores it and advances program dump address, in the format:
DdH, "data"

Note: "data" may be up to 64 bytes.

- To start execution of V-code program from beginning, CCH is sent.
- To continue execution of V-code program from point at which it was interrupted by mode selection, COH is sent.

Example (All numbers are hexadecimal)

Program dump from host-computer in V-code mode
Load address is: 0104; Data is: 12345678, OA, OB, OC.

a. Mode select: 20, 20, 44

b. Program dump start: "L" "L" "load-addr" "CS"
23, 23, DD, 01, 04, E2

c. Program dump data:
"L" "L" —OC data bytes— "CS"
2C, 2C, DO, 31, 32, 33, 34, 35, 36, 37, 38, OA, OB, OC, 95

APPENDIX 2 (for VP412 only)

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INSTRUCTION SUMMARY

V-CODE REFERENCE CARD

Release 3.0

DEFINITIONS

Data stack	= parameters
Address stack	= subroutine return addresses
Stack width	= 16 bit
Stack depth	= 96(data + address stack)
mnm	= mnemonic
opc	= opcode hexadecimal
stack before	= data stack before execution (top is to the right)
stack after	= data stack after execution (top is to the right)
addr	= memory address
n	= picture number (binary) or time code (high byte = minutes; low byte = seconds)
u	= 16 bit unsigned integer
b	= single byte (high byte = 0)
c	= ASCII character value (high 9 bits = 0)
f	= Boolean flag (zero = false, non-zero = true)

VP412 LASERVISION PLAYER CONTROLS

mnm	opc	stack before	stack after	short description
PLAYU	50	n		normal play with automatic stop(n)
SLOWU	53	n,b		slow play with automatic stop(n)
FASTU	46	n,b		fast play until stop picture (n)
PLAYCH	68	b		fast access to first picture in a chapter and play goto picture (n)
RAU	47	n		Fast access to time code
GTIME	67	u		single step forward
SSF	3E			single step reverse
SSR	3C			stop playing
STOP	73			continue previous play action
CONT	61			read picture number
RAP	3F	n		await autostop
WAITA	41			await picture number
WAITU	75	n		OPEN front loaded tray
OPEN	5E			get disc identification
IDENT	79		u,f	switch ON
ON	4F	u		switch OFF
OFF	51	u		

ON/OFF switch functions (u)

bit	dec	default	function	remarks
0	1	on	video	
1	2	on	audio 1	
2	4	on	audio 2	
3	8	off	local control	
4	16	on	remote to V-code	remote control
5	32	off	picture number	
6	64	off	chapter number	
7	128	off	TEXT from disc	
8	256	on	TEXT background	TEXT decoder function
9	512	off	video from external	
10	1024	off	audio 1 from external	
11	2048	off	audio 2 from external	
12	4096	off	TEXT maxmode	adapted TV-set required

Remaining 3 bits are reserved for future use

DATA STACK

mnm	opc	stack before	stack after	short description
DUP	64	u1	u1,u1	duplicate top of stack value
DROP	78	u		drop top of stack value
SWAP	5A	u1,u2	u2,u1	swap top two stack values
OVER	6F	u1,u2	u1,u2,u1	copy 2nd value to top
ROT	59	u1,u2,u3	u2,u3,u1	rotate top three values
SHIFT	5C	u1,b	u2	shift left (0-15), right (16-31)
LD0	30		0	stack
LD1	31		1	stack
LD2	32		2	stack
LD3	33		3	stack
LD4	34		4	stack
LD5	35		5	stack
LD6	36		6	stack
LD7	37		7	stack
LD8	38		8	stack
LD9	39		9	stack
LBYTE	27		b	single byte stack
LWORD	22		u	16-bit word stack

Arithmetic (data stack)

ADD	2B	u1,u2	sum,f	addition of top two stack values
SUB	2D	u1,u2	diff,f	subtraction from second stack complement (boolean)
NOT	2F	f1	f2	

Comparison (data stack)

EQUAL	3D	u1,u2	f	true if equal
LEQ	2C	u1,u2	f	true if less than or equal

ADDRESS STACK

mnm	opc	stack before	stack after	short description
RETN	40			drop top of address stack
POP	60			pop 2nd address stack value
START	2A			reset data + address stack

INPUTS

mnm	opc	stack before	stack after	short description
-----	-----	--------------	-------------	-------------------

Keyboard input

DIGIT	4E	b1	b2	single digit (up to digit b1)
KEY	4B		c	single ASCII character
BINI	4A	b	u	number (up to b digits)
STRING	77	b	adr	string (up to b characters)
ENINT	45	c		enable interrupt by key

Touch screen input

TOUCH	74	adr	u	touch screen input
ENTI	69	adr		enable interrupt by touch

General input

TIMOUT	71	u		enable input time-out
--------	----	---	--	-----------------------

RS232C/IEEE-488 input

INM	2E	adr		awaits next control string
-----	----	-----	--	----------------------------

Note: Only available with the VP412

MEMORY ACCESS

mnem	opc	stack before	stack after	short description
LOAD 3A		adr	u	load from memory
STORE3B		u,adr		store into memory
COMP 56		adr1, adr2	f	compare two strings
MOVE 4D		adr1, adr2		move string

OUTPUT

mnem	opc	stack before	stack after	short description
SOUND 76		b		sound beep
OUTS 21		u		output (bin) to RS232/IEEE-488
OUTM 25		adr		output (str) to RS232/IEEE-488
OUTRC 72		u		output via SCART

TELETEXT

mnem	opc	stack before	stack after	short description
WRSUB 26		adr1	adr2,b	display: str until substitution
WRITE 28		adr		display: string
SPACES 20		u		display: spaces
EMIT 65		c		display: single character
BINO 6A		u		display: number
TERM 29				terminate display
CLEAR 63				erase teletext
PAGE 70		u		select teletext-page (transm)

String control bytes:

AOH = space suppression (followed by number of spaces in binary)
 80H = new row (followed by row number in binary)
 8CH = substitution point (followed by the field width in binary)
 8FH = string terminator

PROGRAM CONTROL

mnm	opc	stack before	stack after	short description
DO 44		u1,u2		subr call + set loop limit, index
LOOP 4C				repeat subr until index = limit
INDEX 58			u	loop index -- stack
LEAVE 6C				set loop limit to index
IF 49		f		select subroutine by boolean
CASE 43		b1,b2		select subroutine by number
BEGIN 42				subroutine call
UNTIL 55		f		repeat subr call on false (after BEGIN)
WHILE 57		f		subroutine call on true
REPEAT 52				repeat subroutine call (after WHILE)
MARK 6D				save data + address stack
BACKW 62		b		get latest or prev saved stack
EXIT 5F				exit V-code program

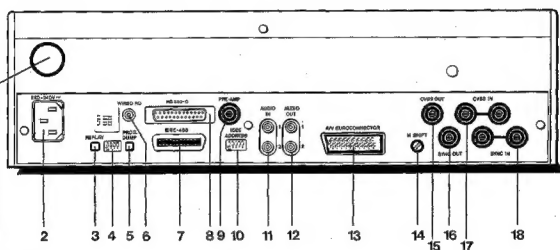
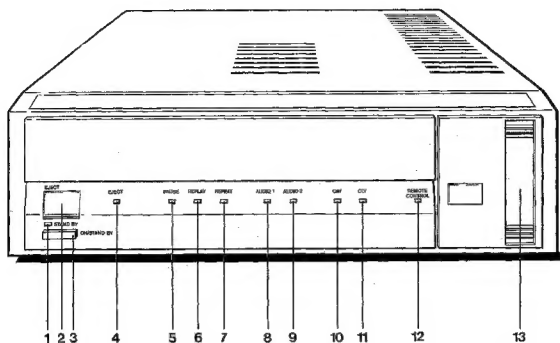
MISCELLANEOUS

mnm	opc	stack before	stack after	short description
WAIT 54		u		wait (0.1 second interval)
LPROG 24				additional program dump (Laservision disc)
CONFIG 7A		b		selects protocol for RS232/ IEEE-488 interfaces.
OVLY 23				overlay program dump from LV-disc

INSTRUCTION SUMMARY

dec	hex	char	mnm	dec	hex	char	mnm
32	20		SPACES	80	50	P	PLAYU
33	21	!	OUTS	81	51	Q	OFF
34	22	"	LWORD	82	52	R	REPEAT
35	23	#	OVLY	83	53	S	SLOWU
36	24	\$	LPROG	84	54	T	WAIT
37	25	%	OUTM	85	55	U	UNTIL
38	26	&	WRSUB	86	56	V	COMP
39	27	'	LBYTE	87	57	W	WHILE
40	28	(	WRITE	88	58	X	INDEX
41	29	)	TERM	89	59	Y	ROT
42	2A	*	START	90	5A	Z	SWAP
43	2B	+	ADD	91	5B	[=====
44	2C	,	LEQ	92	5C	\	SHIFT
45	2D	-	SUB	93	5D]	=====
46	2E	.	INM	94	5E	^	OPEN
47	2F	/	NOT	95	5F	_	EXIT.
48	30	0	LD0	96	60		POP
49	31	1	LD1	97	61	a	CONT
50	32	2	LD2	98	62	b	BACKW
51	33	3	LD3	99	63	c	CLEAR
52	34	4	LD4	100	64	d	DUP
53	35	5	LD5	101	65	e	EMIT
54	36	6	LD6	102	66	f	=====
55	37	7	LD7	103	67	g	QTIME
56	38	8	LD8	104	68	h	PLAYCH
57	39	9	LD9	105	69	i	ENTI
58	3A	:	LOAD	106	6A	j	BINO
59	3B	;	STORE	107	6B	k	=====
60	3C	<	SSR	108	6C	l	LEAVE
61	3D	=	EQUAL	109	6D	m	MARK
62	3E	=	SSF	110	6E	n	=====
63	3F	?	RAP	111	6F	o	OVER
64	40	@	RETN	112	70	p	PAGE
65	41	A	WAITA	113	71	q	TIMOUT
66	42	B	BEGIN	114	72	r	OUTRC
67	43	C	CASE	115	73	s	STOP
68	44	D	DO	116	74	t	TOUCH
69	45	E	ENINT	117	75	u	WAITU
70	46	F	FASTU	118	76	v	SOUND
71	47	G	RAU	119	77	w	STRING
72	48	H	=====	120	78	x	DROP
73	49	I	IF	121	79	y	IDENT
74	4A	J	BINI	122	7A	z	CONFIG
75	4B	K	KEY	123	7B	{	=====
76	4C	L	LOOP	124	7C	|	=====
77	4D	M	MOVE	125	7D	}	=====
78	4E	N	DIGIT	126	7E	~	=====
79	4F	O	ON	127	7F		(CODE)

Fig. 1b: VP412 CONTROLS AND CONNECTIONS



VP412 (front)

VP412 (rear)

- 1 STANDBY indicator
- 2 EJECT button
- 3 ON/STANDBY button
- 4 EJECT indicator
- 5 PAUSE indicator
- 6 REPLAY indicator
- 7 REPEAT indicator
- 8 AUDIO 1 indicator
- 9 AUDIO 2 indicator
- 10 CAV indicator
- 11 CLV indicator
- 12 REMOTE CONTROL indicator
- 13 EPROM CARTRIDGE interface port

- 1 ON/OFF switch
- 2 MAINS lead socket
- 3 REPLAY on/off switch
- 4 BAUD RATE dip switches
- 5 PROGRAM DUMP switch
- 6 WIRED RC socket
- 7 IEEE-488 socket
- 8 RS232C socket
- 9 PRE-AMP OUT
- 10 IEEE-488 ADDRESS dip switches
- 11 AUDIO IN (1 & 2) sockets
- 12 AUDIO OUT (1 & 2) sockets
- 13 A/V EUROCONNECTOR
- 14 R-SHIFT control [for Genlock]
- 15 CVBS OUT socket
- 16 SYNC OUT socket
- 17 CVBS IN sockets
- 18 SYNC IN sockets

